E1468

Consulting Services for

Environment Impact Assessment

in the

Neretva and Trebišnjica River Basin (NTRB)

No. TF052845/GE-P084608

F I N A L EIA R E P O R T

Sarajevo/Banja Luka, August 2006

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Abbreviations and Acronyms

BiH	Bosnia and Herzegovina
EA	Environmental Assessment
EARB	East Adriatic River Basin
EBS	Population equivalent
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FBIH	Federation of Bosnia and Herzegovina
HNK	Herzegovina Neretva Canton
HPP	Hydro Power Plant
HR	Croatia
HRK	Croatian Kuna
ISWC	Inter-State Water Committee
KM	Convertible Mark
MAFWM	Ministry of Agriculture, Forestry and Water Management
NGO	Non governmental organisation
NP	Nature Park
NTRB	Neretva and Trebišnjica River Basin
PAD	Project Appraisal Document
PMT	Project Management Team
PIU	Project Implementation Unit
RBA	River Basin Authority
RBMP	River Basin Management Plan
RS	Republic of Srpska

SA	Social Assessment
SC	Steering Committee
SEE	South East Europe
TWG	Technical Working Group
WB	World Bank
WFD	Water Framework Directive 2000/60/EC
WWTP	Waste Water Treatment Plant

Bosnia and Herzegovina and Croatia
Proposed Integrated Ecosystem Management of the Nerteva and Trebišnjica River Basin
(NTRB) Project

EXECUTIVE SUMMARY

Introduction

The World Bank has established policies for environmental screening and assessment of loan projects. However, all activities financed by the Bank have to be in compliance with local environmental rules and regulations, as well as with the WB environmental policies.

All World Bank and GEF projects are subject to the existing WB safeguard operational policies and procedures. The OP 4.01, *Environmental Assessment (EA),* stipulates that an EA should take into account the natural environment, human health and safety; social aspects, transboundary and global environmental aspects. These safeguard policies require *inter alia* that affected groups within the project area and local NGOs must be informed and consulted as part of the EA process and project design planning and implementation.

Project objectives

The objective of the project is to improve management of transboundary water resources in the NTRB laying the basis for efficient and equitable water allocation amongst users and for improved health of the ecosystems on which the sustainable economic growth of the project area depends. The project is consistent with the GEF Integrated Land and Water Multiple Focal Area Operation Program, under the International Waterways Operational Strategy (OP#9) as it will: (i) provide a comprehensive framework to manage natural systems across sectors and political or administrative boundaries within the context of sustainable development; (ii) utilize inter-sectoral and participatory approaches to transboundary water resource management and implementation on an ecosystem scale; and (iii) facilitate prioritisation and strategic sequencing of needed policy reforms, investments, and other interventions.

Key indicators to measure project impact would include:

- A transboundary river basin management plan completed and agreed upon by both countries
- A functioning comprehensive hydrological measurement and monitoring program, linked to a transboundary water information system
- Reduced discharge through wastewater effluents of municipal and industrial pollutants to international waterways
- Establishment of a mathematical simulation model for water management (quantity and quality) in the Neretva Delta
- Implement a Pilot Salt Water Intrusion Scheme to reduce soil and water salinity in the Neretva Delta
- Increased number of civil society activities, which engage stakeholders in river basin management planning and improved use of water resources.

The proposed Neretva and Trebišnjica River Basin (NTRB) Integrated Ecosystem Management Project includes four components with their respective costs as shown in Table 1.:

Table 1: Project Costs – US$ millions

Component	GEF	Other donors	GoBiH	GoC	Beneficiaries	Total
I. Improved Transboundary Water Resource Management	2.72	3.50	0.20	0.04		6.47
II. Improved Management and use of wetlands ecosystems	1.73	0.10	0.07	0.54	0.20	2.64
III. High priority investments for water pollution control	3.37	0.33	3.02	3.25	0.30	10.27
IV. Public participation and Management of Project Implementation*	1.28		0.74	0.50		2.51
Total including physical and price contingencies	9.11	3.93	4.03	4.32	0.50	21.89
In percent	42%	18%	18%	20%	2%	

* Includes costs for overall project management. US$ GEF 0.70 million; BiH US$0.74 million; GoC US$0.50, Total US$1.93 million

In accordance with World Bank policies and procedures (OP/BP/GP 4.01, *Environmental Assessment*) the project has been assigned the environmental category "B". The Borrower requirements for this environmental category include development of an EA study with EMP for each specific activity proposed by the project investments. According to national regulations of both BiH and Croatia, planned project activities do not fall under categories that require EIA. However, EA procedure of WB is required and it includes conductance of public consultation procedure. Document for Public consultations was prepared and sent to project activity municipalities and after revision of the document Public consultations were held in municipalities of Konjic, Trebinje (covering activities in Nevesinje and Bileća as well), Ljubuški (also covering activities in Hutovo Blato) and Baćinska Lakes (including salt water intrusion). Public consultations have been recorded and presented in Annex 6.

Several selected activities requiring an EIA have been identified during the EA inception report phase as presented below:

1) Bileća municipal wastewater collection and treatment infrastructure
2) Konjic municipal wastewater collection and treatment infrastructure:
3) Ljubuški municipal wastewater treatment infrastructure
4) Nevesinje municipal wastewater collection and treatment infrastructure
5) Trebinje municipal wastewater collection and treatment infrastructure
6) Upgrade to wastewater treatment system at the "SurTec Eurosjaj" and UNISGAL metallurgy companies in Konjic to reduce emissions of toxic chemicals
7) Protection from salt water intrusion in the Neretva Delta
8) Strengthening of the Alagovac dam through development of a monitoring program
9) Small grants project
10) Wetlands Restoration in Hutovo Blato

11) Improvement of tourist site at Baćina Lakes
12) Improvement of tourist site at Vjetrenica Cave

Since there is a possible transboundary impact of NTRB project, several meetings during the project preparation took place with participants from Serbia and Montenegro, so that the representatives are informed about the project objectives and activities. None of the project activities was identified as a activity with significant large scale negative impact on wider environment, not during the construction, nor during exploitation. All environmental impacts are identified as positive.

Chapter 1 describes Project components and gives an insight in the scope of work performed during EA preparation, as well as Project description and its objectives.

Moreover, Chapter 2 describes project arrangement and gives introduction to policy and administrative framework of WB, BiH and Croatia and their comparisons, as well as environmental policies of beneficiary countries and WB.

Chapter 3 described base line data of Project region that include description of geography, environment, biological aspects, climate, etc.

Environmental impacts identified during project preparation are described in Chapter 4.

Chapter 5 gives general aspects of EMP as an introduction and afterwards elaborates Project sub-components in terms of description of their activities and affiliated EMPs.

In Chapter 6, where applicable, Alternatives for selected projects were described.

At the end of the document, in Chapter 7, environmental framework guidelines for small grants program and salt-water intrusion are described.

EIA

According to general WB safeguard policies, all investment activities must be subject to an environmental management process framework consistent with beneficiary countries and World Bank environmental policies, procedures and regulations.
Generally, the impact of proposed activities on the environment is positive. No significant threats to the environment or environmental impacts have been identified in any of the project activities. The environmental impacts, if any, deal with the construction works, or issues such as waste management and wastewater releases during operation. During public discussions and consultations, it was concluded that there is no major opposition to the project, and that the projects benefits with regard to improved living conditions and efficient natural resource use are far more significant.
Developed Environmental Guidelines include obligations and responsibilities of the PIU and borrower concerning screening procedures, EA documentation, consultation, disclosure, and implementation of the project specific EMP shall be incorporated into the project Operations Manual.

1. PROJECT DESCRIPTION

1.1. Background

The proposed project site Neretva and Trebišnjica River Basin (NTRB) is an inter boundary river basin shared by both BiH and Croatia. Within the BiH, this river basin is shared by two entities, the Federation of Bosnia Herzegovina and the RS. The NTRB plays an important part in the economies of both countries and of a total of 430,000 people many of which are considered rural poor. The waters of Neretva and Trebišnjica Rivers are the main source for hydropower generation, irrigation, transport, recreation and drinking water supply. The NTRB is also considered to be of great cultural/historic importance, with ruins dating back to the 4th century B.C. The natural beauty and cultural heritage of the NTRB support some local tourism but the potential is largely unexploited.

The Neretva River, the largest river of the eastern part of the Adriatic Basin with a length of 220 km,.flows from the RS, towards the FBiH. The Trebišnjica River (99 km) flows entirely through the RS into the Neretva as its major tributary but is hydraulically linked to the Neretva River. The Neretva River watershed has a high diversity of habitats, mainly aquatic and wetland. The upper part of the Neretva Delta, located in FBiH, is a protected area of the Hutovo Blato Nature Park while the lower part of the Delta, located in Croatia, includes five scattered protected areas. The lower flow of the Neretva River from Mostar (FBiH) to the mouth of the river (Croatia) contains the largest and most valuable remnants of the Mediterranean wetlands in the entire Eastern Adriatic coast and is one of the few areas of this kind in Europe. During preparation of NEAP for BiH it was identified that NTRB area is extremely significant considering needs for nature and biodiversity protection. Moreover, entire project area, especially its sensitive ecosystems of karst and wetlands are endangered by different activities. In Croatia the Delta area is also recognized as very significant for protection of nature and biodiversity, so that in last few years there are activities undertaken by Government to protect the are as natural park.

Although 90% of the Neretva River basin is in BiH, with the lower basin and delta primarily located within Croatia, inter boundary cooperation is essential because decisions and management in BiH regarding upstream have significant impacts in Croatia; yet this cooperation is uneven. The challenges of meeting conflicting requirements of water and land by users are most prevalent in the lower Neretva because the use and management of the upper basin water resources have a very strong impact on downstream ecosystems (e.g. operation of the five hydropower plants in the upper and middle flows of the Neretva and Trebišnjica Rivers).

Both entities in BiH and Croatia have their own water legislation, water rights, water management practices, and institutions, which unfortunately lack in coordination. No institution has been effective in maintaining adequate monitoring and evaluation of the supply, demand and quality of water in detail permitting adequate planning and regulation. Moreover, the lack of a comprehensive hydrological monitoring system triggers few reliable scientific data and weak, which hampers the rational allocation of water rights through concessions. management tools. Water use is theoretically based on a permit system in each country but the basis for water use licenses and permits as well as enforcement procedures are inadequate. Water pricing, particularly for irrigation, is ineffective, e.g. in the delta

region, where land tenure rights are vague and charges for irrigation water are essentially ignored.

1.2. Project objectives

The objectives of the proposed project are to maintain conservation of biodiversity in NTRB area, to improve management of inter boundary water resources within the project region through strengthening national and inter boundary institutional framework; to apply an integrated river basin-level resource planning for efficient and equitable water allocation amongst users; and to pilot specific investment projects.

The following four studies have been developed during Project implementation preparations with most of their findings being incorporated in the current EA report:

The "Inter boundary assessment of the ecosystems and biodiversity of the NTRB"[1] provides a comprehensive analysis of the state of the environment in the project region, focusing on the biodiversity and protected area management issues. Moreover, the study includes an assessment of cultural heritage resources.

The "Water and land management in the river basins" study reviews the water management and environmental flows, the water and land use, and all users (hydropower, irrigation, agriculture, drinking water, recreation, fisheries). Including identification of problems and their mitigation.

The "Economic evaluation of biodiversity, natural and cultural resources of the project region": report identifies the following aspects: (i) the economic value of the existing resources (water, land, forests); (ii) their current use in the basin; (iii) the social and economic aspects of threats to water and land resources (e.g. the impacts of tourism, local industry, (iv) the consumptive use of natural resources for forestry, agriculture, grazing, hydro-technical works, traffic); (v) the existing local development initiatives that demonstrate linkage between economic benefits for local communities and improved water resource management, (e.g. rural tourism, traditional community activities, provision of accommodation in traditional homes, guiding and site interpretation, local production of handicrafts, and traditional agriculture); (vii) the key stakeholders including the analysis of their capabilities, interests, conflicts, and potential roles in project implementation.

The "Social Assessment" report identifies important social and rural development issues and their relation to the project objectives. Moreover, the study assesses the current level of participation of communities in decision-making related to water resource management and identifies the existing structure and mechanisms needed for community participation in the project; Recommendations on how to support community based organizations to facilitate a partnership on water and environment, with concerned NGOs, and with county/cantonal/municipal development committees are also highlighted.

[1] Please note Refernces for more information on Studies

1.3. Project components

The project proposes investments within the territory of the Republic of Croatia and Bosnia and Herzegovina, East European Countries located in the Western Balkans. The project area is part of the Dinaride Alps Karsts, with the NTRB being located 90% in BiH.

The proposed project would consist of the following four components: (i) Improved transboundary Water Resources Management; (ii) Improved management and use of wetlands ecosystems (iii) High Priority Investments for Water Pollution Control; and (iv) Public Participation and Management of Project Implementation

Component 1: Improved transboundary water resources management

The objective of this component is to strengthen the institutional capacity for the comprehensive management of the NTRB's water resources and environment. It will improve water resource management capacity in both countries and strengthen the transboundary mechanisms (institutional, technical, and regulatory) and tools for effective water resource management. The proposed Project sub-components activities include:

1.1 Institution and capacity building

- Support and equipment for the river basin management authorities
- Support for operations of the Adriatic sub-committee of the ISWC
- Training on preparation of river basin management plans and implementation of the EU WFD
- Design of a set of appropriate regional coordination procedures for transboundary water resource management
- Identification of necessary additional policy and institutional reforms to facilitate enhanced transboundary management actions

1.2. Measurement, monitoring and information management

- Equipment and expansion of the existing network of water measurement and monitoring stations in the NTRB
- Develop basin-wide water information system including GIS system, equipment and training

1.3. River basin management planning

- Preparation of background studies for development of the NTRB RBMP
- Identification of protected areas in NTRB, sensitive ecosystems, and ecological management objectives for the NTRB
- Conduct an economic analysis of water use in the NTRB
- Develop river basin management plan

Component 2: Improved management and use of wetlands ecosystems

The objective of this component is to maintain and conserve water dependent ecosystems and their associated biodiversity in the NTRB, according to requirements of the EU WFD. The component has a balance of protection and prevention. It has three sub-components: Improved management of sensitive ecosystems; Water managrement infrastructure; and

Improved operation of reservoirs, HPPs and dams. The activities to be financed under this sub-component are:

2.1 Improved wetlands management

- Improvements in sites, services, and management tools for the existing nature park in the NTRB in BiH and five protected areas in Croatia
- Conservation of wetlands sites used for eco tourism to mitigate potential negative environmental impacts
- Refurbishing of scientific and educational facilities for wetlands biodiversity conservation & financing of the transboundary newsletter "NASA Neretva"
- Salt Water Intrusion Pilot Project in the Neretva Delta in Croatia. The objectives of this activity are to identify and elaborate a sustainable solution for the reduction of negative impacts of salt intrusion, and to apply recent research results and modern irrigation technology as well as good agricultural practice on a pilot area of about 400 ha to increase and maintain sustainable crop production. As the Neretva Delta is a priority area for future country-wide irrigation development in Croatia, the Government of Croatia (GOC) is ready to co-finance the rehabilitation works and eventually upscale the rehabilitation/development measures once their effectiveness and beneficial impact on crop production and environment is proved. It is understood that any intervention planned on arable (and irrigable) land in the Delta will be undertaken with the full participation of the concerned farmers. The pilot project has two tasks: a salinity assessment study and a rehabilitation/development project for sustainable land use practice in the Neretva Delta.

2.2 Water Management Infrastructure:

Protection from saltwater intrusion in the Neretva Delta. This activity will finance preparation of a monitoring network for salt water intrusion and a feasibility study for infrastructure options to reduce salt water intrusion.

Wetlands Restoration in Hutovo Blato: This activity will finance infrastructure to regulate the water regime in the Krupa River within Hutavo Blato Nature Park in order to restore natural wetlands in the Park.

Rehabilitation of Bunica River gate and wooden irrigation wheels: This activity will finance reconstruction of flood regulation gate and 10 wooden irrigation wheels on the Bnica river in BiH.

Restoration of River Banks. This activity will finance investments to reduce erosion processes along the banks of the Neretva River and its tributaries including the right river bank of the Neretva River at Capljina, and at locations on the Bregava, Trebizat and Lade, and Bregava rivers.

2.3 Improved operation of reservoirs, HPPs, and dams

- Conduct a study to re-evaluate and determine the minimum biological flow in the Neretva and Trebisjnica rivers
- Prepare a plan, guidelines, and training program for optimal management of HPP reservoirs

- Develop and test a comprehensive dynamic management model for reservoir operations
- Equip Alagovac dam for seismological monitoring

Component 3: High Priority Investments for Water Pollution Control

The objective of this component is to reduce water pollution to the NTRB through high priority investments in low cost, appropriate wastewater technology improvements in three municipalities and one industrial sector in BiH. The municipalities and industries will contribute a minimum of 50% of the investment costs. It has three sub-components: Municipal wastewater treatment improvements; Industrial Pollution Control; and Strengthening of water quality monitoring laboratories. The activities to be financed under this component are:

3.1 Municipal wastewater treatment improvements in BiH . Water pollution from municipal sources is one of the main threats to the water resources of the NTRB. This sub-component will finance improvements to wastewater treatment in five municipalities in BiH – Bileća, Konjic, Ljubuški, Nevesinje and Trebinje - to reduce pollution in the Neretva and the Trebisjnica Rivers. Next to the city of Mostar, where an existing World Bank financed project is supporting an upgrade to the municipal wastewater treatment plant, these municipalities are the most significant municipal polluters in the NTRB. (Through the World Bank financed Croatia Coastal Cities Pollution Control Project, Croatia is contributing US$3.25 million for rehabilitation of the municipal wastewater treatment plants in the two cities in the Neretva Delta – Metkovic and Opuzen – and extension of the sewerage network in Maliston Bay). Pre-feasability studies conducted during project preparation examined technical options for the investments and proposed solutions. GEF financing of the upgrades will be matched by the municipalities. In general, the project will support:

Bileća municipal wastewater collection and treatment infrastructure Bileća, population 14,000, is situated on Bileća lake - the headwaters of the Trebisnjica river. The artificial lake serves as the drinking water supply for the major municipalities in the region and well as for Dubrovnik in Croatia. The pollution caused by the discharge of inadequately treated wastewater from Bileća leads to severe eutrophication of the lake in the summer as well as bacteriological contamination, which threatens public health. Rehabilitation of the wastewater collection and treatment system is a top environmental priority in RS. The project would finance upgrade to secondary treatment and expansion and rehabilitation of the collection system which currently covers only 55% of the population.

Konjic municipal wastewater collection and treatment infrastructure: Konjic municipality in the FBiH (population 20,000) is the first major town on the Neretva River, with the wastewater releases directly impacting further, downstream settlements both in BiH and Croatia. Particularly significant is the declining water quality in Jablanica Lake, immediately downstream from Konjic. The lake is used for recreation, potable water use, and irrigation. The wastewater collection system currently in place is fragmented, with outdated equipment and provides incomplete treatment. Certain portions of the collection system are not connected to the sedimentation tanks, but are directly discharged into the Neretva River. The project will finance upgrade of the collection system and installation of equipment for secondary biological treatment.

Ljubuški municipal wastewater treatment infrastructure Ljubuški municipality in the FBiH, population 30,000, discharges its wastewater effluent into the Trebizat River. The Trebizat River and its karst basin is a very sensitive area within the NTRB. It has a unique travertine ecosystem for the basin. Located near the Croatian border, its pollution through the karst has direct transboundary pollution impacts. The project will finance rehabilitation to upgrade the secondary wastewater treatment system for nutrient removal; rehabilitation of the sedimentation tanks; and equipment for sludge dewatering.

Nevesinje municipal wastewater collection and treatment infrastructure. Nevesinje municipality in RS, population 14,000, discharges its wastewater effluent into the Algovac reservoir which is used for the drinking water supply of the town. Insufficient capacity of the collection system has resulted in emergency public health situations when septic tanks have proven inadequate to handle flows. The primary treatment facility needs upgrades to provide improved nutrient removal as eutrophication of the reservoir is a problem

Trebinje municipal wastewater collection and treatment infrastructure. Trebinje is a town of RS and has a population of about 32,000. Only 60% of the city is covered by sewerage and this has resulted in significant pollution of the Trebišnjica River into which it directly discharges. The project would finance extension of the collection system and upgrades to the wastewater treatment plant to provide secondary treatment and nutrient removal.

3.2 Industrial Pollution Control in BiH (GEF US$ xx). While industrial pollution has decreased in the NTRB since the war, hot spots of industrial pollution have been identified and can be expected to increase as economic activity develops. The two metallurgy companies (UNISGAL and "SurTec Eurosjaj") in Konjic have been identified as particularly "hot spots" industries by local authorities. Wastewater effluents from the plants are acidic, basic and contain chromium. They receive inadequate primary treatment and there is no recycling of water within the plants thus producing unnecessarily large quantities of wastewater. Previous work at the plant, financed by USAID in 2002, identified low cost improvements that could be made to recycle production water and to improve wastewater treatment particularly reduction in the heavy metals concentration. The project will finance equipment to recirculate rinse waters; concentrate collectors; batch processing equipment; and sludge processing and neutralization equipment. The two companies will finance a minimum of 50% of the costs.

The project will also finance capacity building for monitoring and enforcement of industrial wastewater effluents by upgrading the municipal water quality laboratory (see below) and by developing effluent standards; developing enforcements guidelines; and training.

3.3 Strengthening of Water Quality Monitoring Laboratories

Water quality laboratories are either poorly equipment or non-existent at the municipal wastewater treatment plant facilities. The project will finance equipment for three water quality laboratories in BiH which can then more broadly serve the region for purposes of monitoring wastewater effluent.

Component 4: Public Participation and Management of Project Implementation

The objective of this component is to increase civil society participation in the decision making process for water resource management and to establish an incentive mechanism for responsible, local level resource management. It also finances project management. It has three sub-components: Scientific community involvement; Civil society participation; and Management of project implementation. The activities to be financed are:

4.1 Scientific Community Involvement:

- Establishment of a basin wide working group with representatives from principal universities and resource institutes to facilitate transboundary and cross-sectoral scientific exchange. The group will advise the TWG so as to ensure application of scientific knowledge into the water resource decision making process.
- Finance four annual workshops to disseminate results of scientific community to a broad range of stakeholders

4.2 Civil Society participation:

- Training and facilitation to support community participation in preparation of the RBMP
- Supporting grants for NGOs transboundary partnerships and projects which address the NTRB objectives
- Community based demonstration projects through matching grants of practices which conserve water resources, promote improved water quality, reduce pollutant loads, and maintain wetlands.

Community based demonstration projects will be identified during the project development. These projects will have relatively small financial support and therefore will have relatively small but positive environmental impact.

4.3 Management of Project Implementation

The budget for this component includes project management (GEF US$0.70 million) which will be divided amongst the agencies responsible for implementing the project activities. Project management would include management of the project; monitoring of the project; and training for national and local government officials on project implementation, during the five-year period of the project implementation; office equipment and vehicles; operating costs; and project management staff in BiH (for procurement and financial management only), and in Croatia, as needed.

2. POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

The World Bank has established specific policies for environmental screening and assessment of the proposed projects. However, all activities financed by the Bank should be in compliance with the local environmental rules and regulations as well as with the environmental and social policies of the Bank[2].

During the initial stage of this report, the WB policies and the national policies for both countries were compared. Annex 2 presents the outcomes of this analysis, which concluded that BiH and Croatia have comparable policies

2.1. Overall Project Implementation Arrangements[3]

The project will be implemented during FY 2007-2012. Although there are two GEF grants, the recipients intend to implement the project jointly, e.g. joint contracts, tendering, TORS, to fully ensure the inter-state quality and objectives of the project. On the transboundary level, overall coordination of project implementation will be the responsibility of the ISWC. The ISWC will be supported by the joint Steering Committee (SC), established during project preparation and consisting of authorized representatives (8 from BiH and 4 from Croatia) of relevant ministries from both countries (ministries responsible for environment, water management, cultural heritage, energy, communal infrastructure) and the Technical Working Group (TWG) (shown as one body in the organizational figure because members overlap). The TWG will consist of experts in water, environment, agriculture, and energy sectors; HPP authorities; municipal representatives; and NGOs. The core of the TWG will be that group established during project preparation, with additional members as noted above. It is already functional and fully financed by the countries. The TWG significantly contributed to, and supervised, project design. It is proposed to establish sub-groups of the TWG to provide sector specific assistance on specific issues and project activities. This is a model used by both countries in other similar river basin commissions, e.g. the Sava River Commission.

In BiH the overall project implementation is the responsibility of the two entity ministries of Agriculture, Forestry and Water Management. The two entity ministries of environment will be responsible for implementation of those project activities under their mandate primarily maintenance of protected areas and protection of sensitive ecosystems. The BiH State level Ministry of Foreign Trade and Affairs (MOFDA) will coordinate the activities of the implementing agencies across sectors and entities and will serve as the liaison with Croatia. A project management team (PMT) will be established with the members delegated from the ministries of water and environment and financed as part of the government contribution. The project manager will be from MOFDA. Procurement and financial management assistance are required and would be financed by the grant. Upon the establishment of the two offices of the Adriatic River Basin Authority in Mostar and Trebinje, which report to the

[2] Note: activities financed by the Bank have to be completely in compliance with local environmental rules and regulations if for those activities national rules and regulation are stronger than those required by the Bank.
[3] The entities responsible for implementation should be noted where appropriate in the EMP (under the Responsible Entities)

MAFWM, it is expected that project implementation activities would be managed from these locations.

In Croatia the project implementation is the responsibility of the Ministry of Agriculture, Forestry and Water Management through Croatia Waters. The Ministry of Culture and the Ministry of Environmental Protection and Physical Planning will have responsibility for implementation of project activities within their scope, similar to that noted above for BiH. A project management team would be established within Croatia Waters with the support of experts from the three Ministries (Ministry of Agriculture, Forestry and Water Management; Ministry of Environmental Protection, Physical Planning and Construction; and Ministry of Culture). The project management team will be financed by government contribution. Procurement and financial management assistance are required and would be financed by the grant. During project preparation, the project management teams in each country have developed strong working relationships with each other and across sectors and it is expected this will continue.

The Operations Manual (to be completed by appraisal) spells out the implementation arrangements and clear roles and responsibilities for each agency.

2.2. Requirements of the WB

The World Bank's environmental assessment policy OP 4.01 is considered to be the umbrella policy for the Bank's environmental safeguard policies. These policies are critical to ensuring that potentially adverse environmental and social consequences are identified, minimized, and mitigated. These policies receive particular attention during the project preparation and approval process.

The Bank undertakes screening of each proposed project to determine the appropriate extent and type of EA to be undertaken and whether or not the project may trigger other safeguard policies. The Borrower is responsible for any assessment required by the Safeguard Policies, with general advice provided by Bank staff.

The safeguard policies and their application to NTRB project are given in the Table 2.1.

Table 2.1: WB Safeguard Policies triggered by the NTRB Project

Safeguard Policy	Brief Description	Relevance to NTRB Project
Environmental Impact Assessment – EA (OP 4.01) (NOTE: OP 4.01 is the overarching safeguard policy and is applicable to most projects. This covers environmental	Bank financed projects must be environmentally sound and sustainable. If a project is likely to have potential (adverse) environmental risks and impacts in its area of influence the EA is obligatory. Type and details of the EA depend on nature, scope and potential environmental risks.	RELEVANT. Although EIAs are not expected to be required by sub-projects due to their small size, and type of activities, all sub-projects will require environmental screening and some will require more detailed environmental review and environmental management plans. EIA may be required in some

Safeguard Policy	Brief Description	Relevance to NTRB Project
screening and environmental review, and EIA as well)		exceptional cases, for example if any significant sub-projects will be planed in protected areas.
Dam safety (OP 4.37)	Bank financed new dams must be designed and built under the supervision of component professionals. Dam over 15 meters in height are of concern particularly if there is a requirement for large flood handling or if the dam is in a zone of high seismicity and/or where foundations and other design features are complex.	Two elements of OP 4.37 are relevant: (i) safety, e.g. environment would be devastated in case of uncontrolled release of water from the reservoirs; and (ii) reliable operation, e.g. if a management river flows framework is agreed upon, the physical infrastructure should be capable of implementing it. The client will prepare a report which describes the inspection and evaluation procedures used to monitoring dam safety; the current status of each dam safety report; and make recommendations for any remedial work or safety related measures necessary to upgrade the existing dam to an acceptable standard of safety. The dam safety report is a separate report from the EA.

2.3. Bosnia and Herzegovina environmental policy

In BiH only environmental responsibilities under international conventions are a responsibility of the State through the Council of Ministers, and are co-coordinated by the Ministry of Foreign Affairs and Economic Relations.

In general, environmental issues within BiH are in the jurisdiction of each of the two entities, the FBiH and the RS, as well as the Brčko District. In the FBiH, environmental jurisdiction is even more complex, because the fundamental responsibility for the environmental issues is on the Canton level – there are 10 Cantons in the FBiH. The RS is not administratively organized on a regional level, only on Entity and local levels. The legal framework for efficient environmental management and protection was based on the constitutional right of citizens to a healthy environment, and also on international principles in this field.

New environmental legislation is based on the EC Directives.

A set of five new Environmental Laws was developed in 2000/2001 and now form the basis for future environmental management in the country. They are as follows:

- Law on Environmental Protection;
- Law on Air Protection;
- Law on Water Protection;
- Law on Waste Management
- Law on Nature Protection
- Law on Environmental Fund

Regulations need to be passed to enact these laws, and this will be done within each entity. Some Regulations on Law on Air Protection and on Law on Waste Management were already enacted, both in the FBiH and in the RS.

There is no State Agency that could co-ordinate environmental issues for the country at present (although there are plans to establish a National Environmental Protection Agency (NEPA)). An Environmental Steering Committee (ESC) has been functional since 1998 to assist in co-operative work between the two entities and the co-ordination of environmental activities. The ESC seems to be very efficient, even without the required legal responsibility. Funding from different donors ensured ECS activities until now. It is anticipated that additional funding will be given to extend its activities.

New entity laws on environmental protection regulate the area of environmental assessment and the Environmental Permit procedure. These two entity laws are almost identical, and were prepared in accordance with environmental policies of the EU and international conventions. Permits required by other laws (e.g. waste management permit from the Law on Waste Management, water management permit from the law on water protection), as well as other necessary permits (forestry, agriculture, etc.) are part of the integrated Environmental Permit.

2.3.1. Environmental Impact Assessment Procedure

Plants and installations or significant changes of the existing installations listed in implementing regulation shall be also subject to EIA, if the relevant ministry decides so.

The following should be considered as significant changes of installation and plants:
-Any modification of plants and installations;
-If the total of modifications exceeds 25% growth in production, energy use, water consumption, territory use, emission or waste production,
- if the (last) modification brings to the excess of 25% growth (within ten years).

Decommissioning the operation of the projects and demolishing the sites in connection with such decommissioning is subject to EIA.

An EIA should serve at the identification, description and assessment of the direct and indirect effects of a project on the following elements and factors:

- human beings, fauna and flora;
- soil, water, air, climate and the landscape;
- material assets and the cultural heritage;
- interaction between factors mentioned above.

Relevant authority shall not accept a request for issuing a building permit or other necessary consent for a project requiring an EIA unless the requestor attaches to his application a copy of an approved environmental impact study (EIS – Environmental Impact Statement).

The EIA procedure has to be run by the relevant Ministry. The relevant authorities shall involve all authorities at the cantonal and federal levels.

The plants and installations or significant changes of the existing installations listed in implementing regulation shall be subject to EIA in all cases.

The EIA may be carried out in two phases:

- prior to environmental impact assessment EIA, and
- Environmental impact study EIS.

2.3.2. Screening Procedure

There is no unique screening procedure at state level.

- Federation of Bosnia and Herzegovina

As stipulated by the Law on Environmental Protection of Federation of Bosnia and Herzegovina, screening will be conducted in accordance with a regulation (Official Gazette of FBiH 19/04) establishing a list of projects and activities for which an EIA is mandatory.

- Republika Srpska

Article 58 of Law on Environmental Protection establishes the scope of project subject to mandatory EIA stipulating that project shall be subject to EIA in all cases, as well as projects that shall be subject to EIA if the authority decides so in the screening decision. This shall be governed by a by-law.

2.3.3. Environmental Management Plan

Practice of preparation of the EMP is obligatory only for projects for which the EIA procedure has been met.

2.3.4. Monitoring

In BiH, Laws on Environmental Protection in both entities govern that an environmental monitoring program be a part of an environmental permit, thus making it compulsory for a developer/proponent to implement it.

Ministry of Environment and Tourism in FBiH inspects and controls implementation of the agreed program. Inspections can be conducted on Entity, cantonal or municipal level.

In the RS, depending on the jurisdiction, inspectors can conduct inspections on the RS or municipal level.

2.4. Legislation of Republic of Croatia

Environment protection is traditionally divided between different administrative bodies (sectors, directorates) with separate authorities, which often prevent integral/sustainable approach to environment protection even among them. Above all, it refers to water related problems (that has always been an autonomous administrative unit), nature, environment, physical planning, soil, forests.

After the last Governmental reorganization, several changes occurred in the organizational structures and competencies/responsibilities of the state environmental institutions. The former Ministry of Environmental Protection and Physical Planning (MEPPP) was reorganized into Ministry of Environmental Protection, Physical Planning and Construction (MEPPPC). The new competencies of the MEPPPC do not cover nature protection. The Nature Protection Division was transferred to the Ministry of Culture Affairs.

The former State Water Directorate was transferred to the Ministry of Agriculture, Forestry and Water Management as a new division. The mandate of the former state directorate has remained unchanged.

Responsibility for Industrial Pollution Control and Risk Management is shared between the Ministry of Economy, Labour and Entrepreneurship, Ministry of Agriculture, Forestry and Water Management and MEPPPC.

Responsibility for Chemicals and GMO's is shared between the Ministry of Economy, Labor and Entrepreneurship, Ministry of the Interior, Ministry of Health and Social Affairs, Ministry of Culture Affairs, the MEPPPCE and Ministry of Agriculture, Forestry and Water Management.

Responsibility for Nuclear Safety and Protection against Radiation is shared between Ministry of Health and Social Affairs and Ministry of Economy, Labour and Entrepreneurship.

The Government strengthened the environmental institutional capacity via three new bodies:

- Environment Protection Agency was established in 2002. Its main task is environmental data management.
- Fund for Environment Protection and Energy Efficiency was established in January 2004, mandated to finance preparation, implementation and development of programs, projects and similar activities in the sector for preservation, sustainable use, protection and improvement of environment.
- State Institute for Nature Protection was established in 2003 as a state body responsible for implementation of nature protection policy and providing adequate technical expertise primarily for the Nature Protection Division within the Ministry of Culture Affairs, the MEPPPC and Ministry of See, Tourism, Transport and Development.

The MEPPC is authorized to issue location and building permits and oversee environment impact assessment procedures.

Some authorities (important for this project) have been transferred from the regional level to county offices, while others have been transferred to the local government and self-government level. For example, in compliance with the Law on Waste, local self-government is responsible for municipal waste management (organization, collection, disposal, financing) while counties are responsible for industrial waste disposal. The management of hazardous waste has been raised to the state level.

In Croatia, one additional safeguard mechanism closely related to the environment has existed for years i.e. the obligation that the location of any plant has to be approved by Physical plan and the location of the plant must be marked in physical plans. This concerns

urban areas, where physical plans are obligatory and detailed, but this can be required also for rural areas. At a minimum, in County and/or City Physical Plans, general recommendations and limitations regarding the environmental impact for development of rural areas and business activities are given. According to the law, County and/or municipalities can set much stronger environmental standards than the national law.

2.4.1. Environment Impact Assessment Procedure

The Environment Impact Assessment has been governed by articles No. 25 to 32 of (NN 82/94). The procedure is defined by the (NN 27/2000). The procedure must foresee possible detrimental impacts of the planned project on the environment based on which adequate environment protection measures are recommended.

The law requires that the EIA should be carried out for selected projects and activities, the latest before issuing the location permit. In compliance with the Law on Physical Planning, locations of the aforementioned structures shall be registered in physical plans of lower order.

Environmental impact assessment is obligatory for interventions defined in the List of Interventions that is part of Rule Book. Cantons could request EIA for additional plants and interventions.

2.4.2. Screening Procedure

According to Croatian practice, screening process is foreseen only regarding the *"interventions for which environmental impact assessment is obligatory"*. If the activities do not belong to the interventions defined in the *List of Interventions* in the Book of Rules, screening process is not explicitly foreseen. Additional screening could be part of some other permitting process e.g. Building permit or Water use permit or requests and Cantonal regulation.

2.4.3. Environmental Management Plan (EMP)

Environmental Management Plan is not mandatory in Croatian practice. It is mandatory only for projects required to perform EIA.

2.4.4. Monitoring

Environmental monitoring is explicit obligation in Croatia only for objects/projects which require EIA. For other objects/projects, regular supervision, defined by other laws, such as Law on construction etc., is to be conducted.

2.5. Evaluation of project environmental aspects

According to the World Bank requirements, environmental monitoring during project implementation provides information about key environmental aspects of the project, particularly the environmental impacts generated by the project investments and the effectiveness of their proposed mitigation measures. This information allows the borrower

and the Bank to successfully evaluate environmental impacts mitigation as part of project supervision, and to allow corrective action to be taken if needed.

During the project inception phase, the project activities were classified as environmental category B, therefore requiring only an Environmental Assessment (EA) with related EMPs. Component 2 and Component 3 cover the environment issues that require main attention within the EA.

The activities envisaged in Component 2 will include minor construction works for refurbishment of existing structures and improved protected area management. Component 3 will finance activities for municipal and water pollution control and strengthening of water quality monitoring laboratories. The EIAs and environmental management plans would be required for each demonstration project. While the small grants program will be administered according to an operations manual, which would include guidelines for environmental analysis and monitoring of all small grants.

3. BASE LINE DATA

3.1. Environment

The Neretva and Trebišnjica Rivers and their surroundings have been inhabited since ancient times. They reflect impact of centuries of human activity. However, since 1950s, various activities have left a notable mark on the ecosystems. There has been a change in the natural flow regime; imbalance in sediment deposits, transformation of large wetland areas into arable agricultural land, conveyance of water from one sub-basin to another, construction of canal networks, development of hydropower plants, intensive monoculture in agricultural production and an increase in the use of agrochemicals, uncontrolled waste disposal and discharges of untreated municipal and industrial wastewater into water flows.

The Neretva basin encompasses areas of two countries, Bosnia and Herzegovina and Croatia. The area of the basin within BiH currently has 350,000 inhabitants, while some 150,000 inhabitants live in the area of the Neretva basin within Croatia.

Majority of the basin is surrounded by mountain massive of Bosnia and Herzegovina, where Neretva, in its entire flow forces its way through the Dinarides to the Adriatic Sea. Length of the Neretva course is 250 km, with an elevation drop of 1,050 m, while some 720 m of elevation decrease can be used for hydropower production.

Neretva river has a high flow, while the area surrounding the river is rich with karst valleys, fertile and arable land, diverse wetlands, all of which play an important role in the economic development and well-being of the population in the area. In geological terms, this area is typically karst, made up mostly of limestone rocks. Along with the limestone, the basin is also marked with dolomite rocks with very low permeability, acting as barriers to groundwater flows.

Neretva River, with its significant elevation drop is one of the major energy potentials in Bosnia and Herzegovina. Currently, in the upper and middle areas of the basin the installed hydropower infrastructure amounts to 1120 MW, with the average annual energy production of 3393 GWh. The artificial lakes (accumulations) in the basin ensure constant river flow, and prevent high waters and floods, that is environmental accidents.

The Neretva basin can roughly be divided into three areas: the upper, middle and lower (Delta) watershed. In the upper watershed, from the source to the city of Jablanica, Neretva receives a high number of tributaries. On the right side, the tributaries are Raketnica, Ljuta, Trešanica, Kraljušćica, Neretvica and Rama, while Neretva also has another 15 smaller tributaries.

The Dabarsko polje field is the first elevation decrease below the Nevesinje horizon, lower for some 400 m. The amount of water that runs through this field is 210 million m3. Water from the Dabarsko polje field drains into karst sinkholes and surfaces at the source of Bregava river upstream of Stolac.

Underneath the snow capped Lebršnik the Trebišnjica river, the largest European sinking river, starts to flow. Smaller streams become the Gračanica and Mušnica rivers which sink in the Gatačko polje field at some 900 m above sea level, and then appear at the springs of Trebišnjica some 650 m below. During the wet period, subsurface canals where the water from the Gatačko polje disappears into are flooded and cannot receive all of the water in the field. As a result, one portion of this water surfaces prior to reaching the source of Trebišnjica, in the Cerničko and Vatničko polje fields. Flowing over from one horizon to the

next, this water floods the karst fields, while the duration of the flood gets longer going from the upper to the lower horizons.

The uneven, seasonal precipitation in the basin with the area of approximately 1,100 km2, discharges in a concentrated manner through the springs of the Trebišnjica river below Bileća city and then flow towards Popovo polje field. It is characteristic for these springs to have great flow variations, from the minimum 2 m3/s in the dry period to 500 m3/s in the wet period. Sinkholes with the capacity of 300 m3/s cannot receive all of the water from Trebišnjica, which frequently meant that Popovo polje would turn into a lake over 40 km in length, deep up to 40 m and with 1 billion m3 of water. The field would remain flooded approximately up to 250 days in a year.

Through the source of Ombla, one portion of the water from Trebišnjica is discharged through the Dubrovačka River with its length of 5 km which then enters the Adriatic Sea. In the coastal area from Dubrovnik to Hutovo blato, water from Trebišnjica and Popovo polje appear as numerous springs within the sea itself, or in the salty wetlands around Metković, or enter the water within Hutovo Blato.

The main polluters in the NTRB are the settlements and towns with improper sewage systems. The towns of Trebinje, Ljubuški and Grude have equipment for the treatment of municipal wastewater; however, the sewage systems do not cover all the households in the cities and suburbs. Beside this, these installations have only mechanical and biological treatment, while tertiary treatment phase for nutrient removal is missing. Wastewater from households that are not attached to the sewage systems is released into septic tanks, from which excessive wastewater enters the karst ground. In some cases, wastewater is directly released into the ground.

The city of Mostar, the regional center with a population of 105,000, has a sewage system, however it covers only one third of the households, while the rest of them use septic tanks or ground pits for wastewater releases. The sewage is discharged into the river of Neretva on 34 locations9.

Wastewater from the city of Bileća represents yet another problem. Untreated fecal and other sewage is directly discharged into the Bilećko Lake, while
untreated industrial wastewater from the carpet factory "Bilećanka", is released into the sewage system.

There is also a problem of pollution of surface watercourses in the area of Gacko town. Untreated industrial wastewater from the power plant Gacko and the associated coalmines affects the whole downstream watershed of Trebišnjica.

At present, wetlands of marsh habitats are considered highly endangered, along with the species and communities in them, in both watersheds. Since these habitats are located mostly in the lower parts of the river basin, their survival greatly depends on the human activities in the upper areas of the river basin.

Major concerns relevant to the project design are limits on environmental resources and widespread environmental degradation. The key concern is the adequate supply of good quality potable water. However, stakeholders have limited views on what to do to improve the situation. In general, they feel powerless to affect changes. The NTRB project includes activities, which seek to develop initiatives, which help communities to help themselves while demonstrating sustainable use of water resources and biodiversity conservation.

3.2. Biological Aspects

The current biodiversity of the habitats of plant and animal species and of landscape features is the result of Earth's long historical evolution. Floral, faunal and vegetational features of an area are the result of various abiotic and biotic factors, whose interaction creates certain habitat conditions. Ecosystems know no administrative borders in nature, such as borders between municipalities and states. Ecosystems have to be considered comprehensively, especially if they are to be properly protected. This is clearly illustrated by the NTRB, which lies in two countries, the Republic of Croatia and Bosnia Herzegovina, and in two entities in Bosnia Herzegovina. The specific characteristic of the basin is the fact that it is only the Neretva River which has a direct surface connection with the sea. It is therefore that all the activities in the basin directly or indirectly affect the ecosystems of the Neretva basin, its hinterland and also Adriatic sea. The most important ecological factors in the NTRB are the geographical location, geomorphology, lithology composition, glaciations, recent climate conditions, and, undoubtedly, man-made impact. Waters borne on surface watercourses are of particular importance, as well as those from underground watercourses and springs, particularly in the rainy period of the year, when many Karst fields flood. The NTRB is affected by all the changes in hydrological indicators, which occur in these systems. Especially important are the activities related to water, one of the main a biotic factors modifying all other ecological factors which the diversity of habitats of plant and animal species depend on. Based on this and in order to protect the region's biodiversity, the above-mentioned has to be taken into consideration when preparing the Water Resources Management Plan for this region.

The most prominent feature of the NTRB, which represents relief of unique specific quality, is a wide diversity of ecological units. The types of habitats are the following:

- inland surface waters (surface still waters, surface running waters and inland surface water bodies) and marshes (seasonal and permanent)
- inland non-vegetated or sparsely vegetated habitats (screes and rocks)
- grasslands and fens (meadows, pastures and alpine meadows)
- underbrush
- forests
- seacoast
- underground (Karst subterranean hydrological systems)
- cultivated non-forest areas and habitats with weed and tipical vegetation (agricultural land and artificial landscapes)
- underbrush industrial habitats (towns, villages).

The following types of habitats according to the Ramsar Classification are represented in the entire NTRB: A/B (permanent shallow marine waters and marine subtidal aquatic beds), F (estuarine waters), M (permanent rivers/streams/creeks) N (seasonal/intermittent/irregular rivers/streams/creeks), P (seasonal/intermittent freshwater lakes – karst fields), Zk/b (karst and other subterranean hydrological systems), Y (freshwater springs), and 6 (water storage areas).

The following types of habitats are represented only in the Neretva basin: E (sand, shingle or pebble shores), G (intertidal mud, sand or salt flats), H (intertidal salt marshes), J (coastal brackish/saline lagoons), Ts (seasonal/intermittent freshwater marshes/pools), Tp

(permanent freshwater marshes/pools), Ss (seasonal/intermittent saline/brackish/alkaline marshes/pools), O (permanent freshwater lakes), and 9 (canals and drainage channels, ditches).

The habitats represented in the upper part of the Neretva basin, which comprises the section of the Neretva from its source to a onetime confluence of the Rama and the Neretva, are the following: inland waters (rivers, streams, natural and storage lakes), inland unvegetated or sparsely vegetated habitats (screes, rocks), grasslands (meadows, pastures, alpine meadows), forests, underground habitats, cultivated non-forested areas and habitats with weed and ruderal vegetation (agricultural land and artificial landscapes), and underbrush industrial habitats (towns and villages). According to the Ramsar Classification, the habitats on this area belong to the following habitat types: M (permanent rivers/streams/creeks), N (seasonal/intermittent/irregular rivers/streams/creeks), Zk/b (Karst and other subterranean hydrological systems), O (permanent freshwater lakes), Y (freshwater springs), and 6 (water storage areas).

The habitats in the middle part of the Neretva basin, which comprises the section of the Neretva from a onetime confluence of the Neretva and the Rama to Žitomislić, are the following: inland waters, inland unvegetated or sparsely vegetated habitats, grasslands, forests, underbrush, underground habitats, cultivated non-forested areas and habitats with weed and ruderal vegetation, and underbrush industrial habitats (towns and villages). The habitats on this area belong to the following habitat types according to the Ramsar Classification: M (permanent rivers/streams/creeks), N (seasonal/intermittent/irregular rivers/streams/creeks), P (seasonal/intermittent freshwater lakes), Zk/b (Karst and other subterranean hydrological systems), O (permanent freshwater lakes), Y (freshwater springs), and 6 (water storage areas).

In the lower part of the Neretva basin, stretching from Žitomislić to the place where the Neretva enters the sea, there are the following habitats: coastal habitats (mediolittoral, infralittoral, adilittoral, supralittoral), inland surface waters and marshes (rivers, streams, natural and storage lakes, marshes), inland unvegetated or sparsely vegetated habitats (rocks), grasslands (meadows, pastures), forests, underbrush, maquis, underground habitats (caves and pits), cultivated non-forested areas and habitats with weed and ruderal vegetation, and underbrush industrial habitats. The habitats on this area belong to the following habitat types according to the Ramsar Classification: A/B (permanent shallow marine waters and marine subtidal aquatic beds), E (sand, shingle or pebble shores), F (estuarine waters), G (intertidal mud, sand or salt flats), H (intertidal salt marshes), J (coastal brackish/saline lagoons), M (permanent rivers/streams/creeks), N (seasonal/intermittent/irregular rivers/streams/creeks), P (seasonal/intermittent freshwater lakes – karst fields), Ts (seasonal/intermittent freshwater marshes/pools), Tp (permanent freshwater marshes/pools), Ss (seasonal/intermittent saline/brackish/alkaline marshes/pools), Zk/b (Karst and other subterranean hydrological systems), O (permanent freshwater lakes), Y (freshwater springs), 6 (water storage areas), and 9 (canals and drainage channels, ditches). The waters from the Neretva make a large impact on the coastal sea in the Neretvanski Channel region and beyond. Apart from enriching the sea with nutrients, they affect temperature conditions and salinity reduction, which can be felt at a stretch of ca. 60 km.

There is a specific gypsum habitat on the Trebižat River. The development of such habitat is determined by the fulfilment of specific physico-chemical and biological conditions. The key ecological factors for the development of gypsum are the purity, speed, temperature, and hardness of water.

On the basis of the above, it is obvious that the habitats present in the entire Neretva basin are the following:

- inland waters (rivers and streams, both seasonal and permanent, natural and storage lakes)
- inland unvegetated or sparsely vegetated habitats (rocks, screes)
- grasslands (meadows, pastures, alpine meadows)
- forests
- underbrush
- underground habitats (caves)
- cultivated non-forested areas and habitats with weed and ruderal vegetation (agricultural land and artificial landscapes)
- underbrush industrial habitats (settlements and towns).

- in the central and lower parts of the Neretva basin there are also habitats of:
  - karst fields
- in the lower part of the Neretva basin there are also habitats of:
  - seacoasts
  - various wetland habitats.

The Trebišnjica basin is characterized by the existence of fens. The biological and ecological importance of this region is illustrated by the fact that the total of 383 plant associations has been identified in the area stretching from the seacoast to the highest mountains of Bosnia Herzegovina. More than a half of these associations, on the basis of which the classification of habitats is made, belong to the Neretva river basin, which covers only one fifth of the area of Bosnia Herzegovina.

The upper Trebišnjica River basin encompasses the section upstream from Gorica, namely the river basin section discharged through the Trebišnjica spring and the section between the Trebišnjica spring and Gorica.

The river basin section discharged through the Trebišnjica spring encompasses Gatačko Polje, Cerničko Polje and part of Fatnićko Polje and Mt. Bjelašnica hillslopes, while the river basin section from the Trebišnjica spring to Gorica encompasses the Bileća and Gorica Reservoirs with pertaining subbasins of the Sušica surface course, and some seasonal and permanent springs.

The inland water habitats (rivers and creeks, and reservoirs), bare and poorly overgrown land surfaces (scree, rocks), grasslands and fens (meadows, pastures, fens, alpine meadows), forests, underbrush, underground habitats (caves), cultivated non-forest areas and habitats with weed and ruderal vegetation (agricultural land), and developed and industrial habitats (settlements and towns) are encountered in this part of the river basin area. According to the Ramsar classification, habitats in this area belong to the following wetland types: M (permanent running water), N (seasonal running water), P (seasonal/intermittent freshwater lakes - karst fields), Zk/b (karst and other subterranean hydrological systems), Y (freshwater springs) and 6 (reservoirs).

It is significant that in the lower Trebišnjica River basin area the river course through Popovo Polje was trained after construction of the Trebinje 2 HPP, as required for discharge of the "biological minimum" of 8 m^3/s for the Čapljina HPP built on the Trebišnjica in 1985. However, measurements carried out in Hrasno have proven that the stipulated biological minimum is not always discharged into the Trebišnjica, since frequently 2 m^3/s is measured.

The coastal and inland water habitats (rivers and reservoirs), bare and poorly overgrown land surfaces (rocks), grasslands (meadows, pastures), forests, underbrush,

maquis, underground habitats (caves), cultivated non-forest areas and habitats with weed and ruderal vegetation (agricultural land), and developed and industrial habitats (settlements and towns) are present in this part of the river basin area. According to the Ramsar classification, habitats in this area belong to the following wetland types: A/B (marine waters and beds), F (estuarine waters), M (permanent running water), N (seasonal running water), P (seasonal/intermitted freshwater lakes - karst fields), Zk/b (karst and other subterranean hydrological systems), Y (freshwater springs) and 6 (reservoirs).

Therefore, the following habitats are present at the entire Trebišnjica River basin area:

- inland water (rivers and creeks, and reservoirs
- bare and poorly overgrown land surfaces (scree, rocks)
- grasslands (meadows, pastures, alpine meadows)
- forests
- underground habitats (caves)
- cultivated non-forest areas and habitats with weed and ruderal vegetation (agricultural land)
- developed and industrial habitats (settlements and towns).

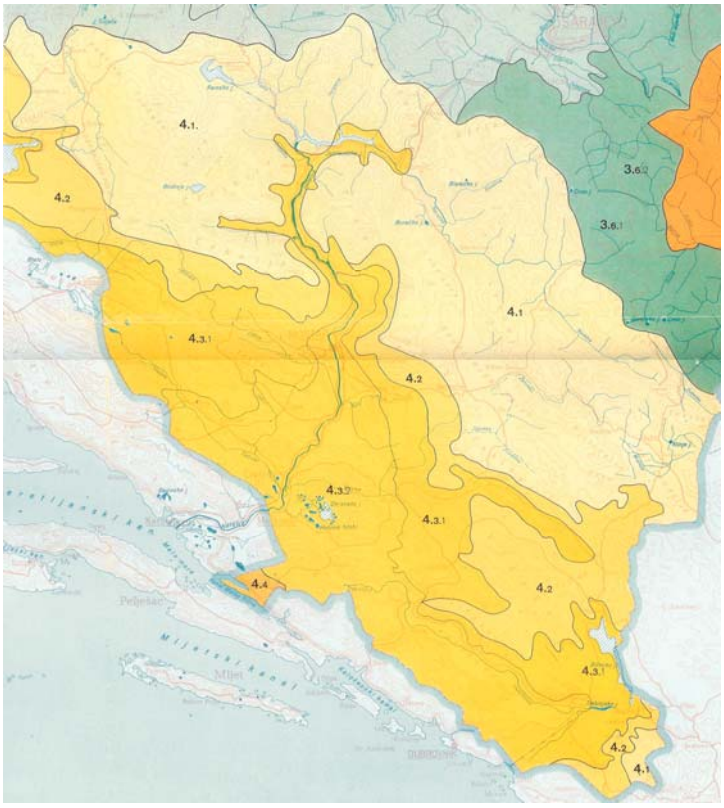
- and in the lower Neretva River basin area, habitats of:
  - coastal area.

In general, wetland habitats and related species and associations still abounding in the NTRB are considered highly endangered today. As these habitats occur mostly in the lower parts of the basin, their survival depends largely on human activities in the upstream parts of the basin. Having in mind that water is an important ecological factor, it is crucial to manage water in the entire basin area from the Neretva source to the "Upper Horizons" in eastern Herzegovina on the principles of sustainability.

Detailed elaboration of rare, endangered and protected species in NTRB are given in Annex 8.

3.3. Climate

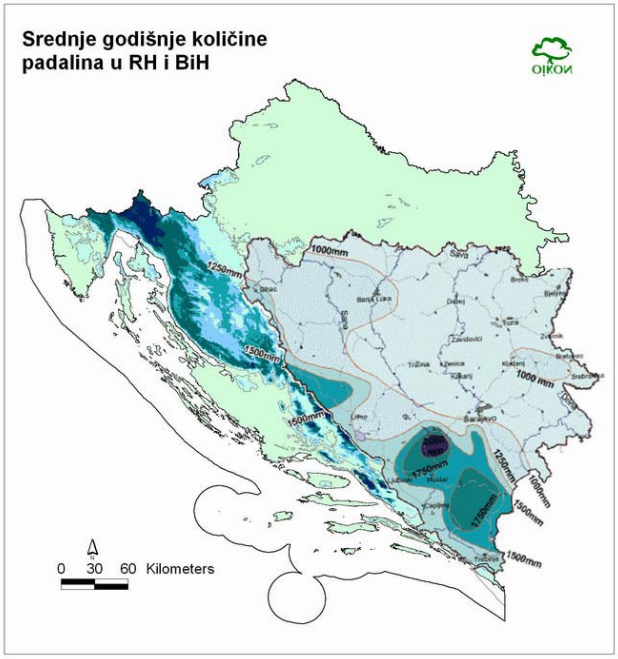
This is the area full of climatic variations. Parts remote from the coast as well as a higher relief part of the river basin have the continental climate with abundance of rainfalls (from around 1650 mm/a year in the Neretva river basin, to 1800 mm/a year in the area of Trebisnjica river basin –which is the average two times higher than the average for all BiH). High mountain area has subalpic climate, with considerable amount of snowfalls sometimes even kept during the summer period. Parts near to the Adriatic sea and relief lower part of the river basin have altered form of Mediterranean climate (middle annual temperature from 10 to 15 °C), with great number of sunny days, rainy winters and long warm summer period. Mediterranean impact along Neretva valley extends quite deeply in the land area (for example, average annual temperature in Mostar is over 16°C). Picture 3.1. shows climate regions in Project region.



Picture 3.1: Schematic map of climate regions in Project area

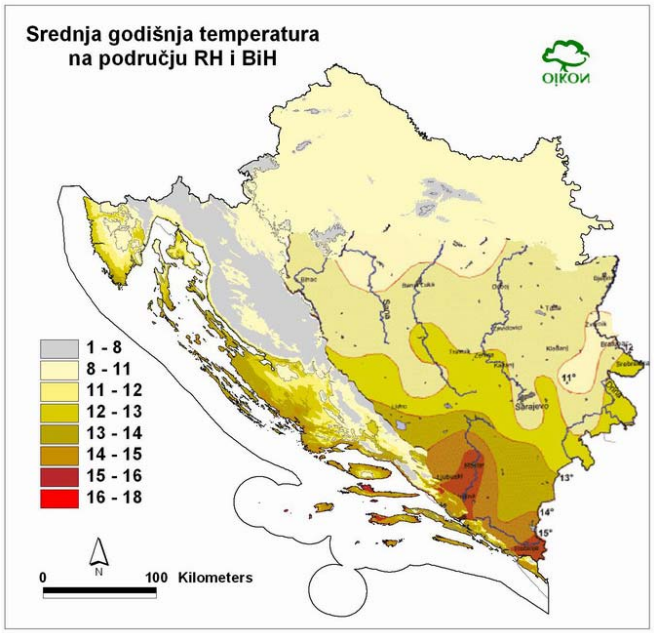
Legend:
- 4.1 Sub-mediterranean mountainous region
- 4.2 Sub mediterranean hilly region
- 4.3 Sub Mediterranean region
  - 4.3.1 Region without evergreen elements
  - 4.3.2 Region with evergreen elements

Picture 3.2. shows average annual amount of **rainfalls** in the area of RH and BiH, where it is obvious that the Neretva and Trebišnjica river basin is absolutely and relatively abundant with the rainfalls. Consequently, with around 11.900 km^3 of fresh water annually, River Neretva is, right behind Nil river, the second river on Mediterranean in terms of intake of fresh water. The most waters of river basin empty into the sea by River Neretva, but considerable amount empty (especially from Trebišnjica river basin) through many other springs (both on land and in the sea).



Picture 3.2. Average annual amount of rainfalls in the area of HR and BiH
(data source: RH – Oikon climatic database; BiH – Bosna S Oil data

Picture 3.3. shows average annual **temperature** in the area of RH and BiH, indicating that temperature is higher in the river basin area than in the surrounding area of similar distance from the sea, first of all due to Mediterranean impact spreading along Neretva valley.



Picture 3.3. Average annual temperature in the area of HR and BiH
(Data source: RC – Oikon climatic database; BiH – Bosna S Oil database)

3.4. Hydrology and Morphology

3.4.1. General Hydrological Features

The basic characteristic of the NTRB is that the terrain rises gradually from the sea level to many mountains at an altitude above 2,000 m.

The entire area is under the influence of the Mediterranean climate, which weakens with the increase in altitude. The average annual air temperature depends on the altitude and varies between 7 and 15 °C, while the annual average precipitation ranges between 1,150 and 1,800 mm. Precipitation is heaviest in wintertime and it often causes flooding. On the other hand, the vegetation period is characterized by the shortage of water.

Due to the abundance of karstic phenomena, the vegetation on this markedly karstic area is poorly developed and there is little arable land. Between 15 and 20 hectares of alpine and subalpine grasslands come per one hectare of arable land. The fields of western Herzegovina descend from an altitude of 900 m to the sea, while the fields of eastern Herzegovina descend from an altitude of 1,100 m to the sea.

The area of the Neretva basin together with the basin of the Trebišnjica, with which the former is connected through underground watercourses, is supposed to amount to ca. 12,750 km^2, even though hydrological yearbooks state that the area of the basins is ca. 9,800 km^2.

In terms of size, the NTRB belongs to a very large basin whose watercourses or their parts lie at altitudes rising above 800 m.

The main four ecological regions that can be differentiated in the basin are the following:

- Submediterranean mountainous region
- Submediterranean hilly region
- Submediterranean region
- Eumediterranean region

The limnological issues of the NTRB are very complex, comprising hydrological and hydrobiological problems related to all the karstic phenomena occurring in this region. The underground represents a specific ecological unit. The most significant feature of the region is a wide diversity of ecological units: there are the habitats of wetlands, flood meadows, soft broadleaves, water, land, and man-made habitats. The Neretva delta represents the largest area of brackish water in Croatia. Gypsum barriers represent a specific phenomenon, particularly on the Trebižat watercourse.

Important traffic routes pass through the NTRB, with a large number of settlements and towns lying along the watercourses. The region is supposed to be inhabited by around 500,000 people, ca. 350,000 of which live in Bosnia-Herzegovina, and ca. 150,000 in Croatia.

The lower part of the upper course and the middle course of the Neretva and the upper course of the Trebišnjica are used for the production of electricity.

There are plans for energetic exploitation of the upper part of the upper course and the upper part of the lower course of the Neretva and some of its tributaries, as well as of water from the "Upper Horizons" karst fields in eastern Herzegovina.

Intensive agricultural production is currently underway only in the Neretva delta region and in Popovo Polje. As part of the project of transposing waters of the "Upper Horizons" from the Neretva basin into the Trebišnjica basin, there are intentions of irrigating

the karst fields of eastern Herzegovina, but 20 years after the construction of hydropower plants.

In the NTRB in general, and particularly in the lower course of the Neretva, there are problems related to maritime influence, i.e. to increased salinization of water and soil due to a drop in the level of groundwaters caused by the deepening of the Neretva riverbed.
The Neretva River basin: The Neretva is the longest and water-richest tributary of the Adriatic Sea. The Neretva supplies the Adriatic Sea with around 11,900 km^3 of fresh water per year from the above-ground basin of an area of some 10,100 km^2. About 90% of the Neretva basin is located on the area of Bosnia-Herzegovina.
The Neretva basin area can provisionally be divided into three units:

- the upper part of the Neretva basin, from its source to a former confluence of the Rama and the Neretva Rivers (a few kilometres upstream of Jablanica)
- the central part of the Neretva basin, from a former confluence of the Rama and the Neretva to Žitomislić
- the lower part of the Neretva basin, from Žitomislić to the sea.

The source area of the basin belongs to a high mountainous region of Bosnia. At a stretch from Jablanica to Mostar the basin belongs to the zone of high karst, and downstream of Mostar it belongs to the lower zone of high karst.
The tributaries of the Neretva joining it in its upper course from the right are the Slatnica, the Rakitnica, the Ljuta, the Bijela, the Trešanica, the Kraljušnjica, the Neretvica, and the Rama, while from the left it is joined by the Lađanica, the Krupac, the Bukovica, the Šištica, the Idbar, and the Draganka.

In its middle course the Neretva is joined by its right tributaries of the Doljanka and the Drežanka, the Radobolje and the Jasenice, while from the left it is joined by its tributaries of the Prenjska River and the Buna.

In its lower course the Neretva is joined by the Trebižat River from the right, and by the Bregava and the Krupa from the left.

3.4.2. Quality of surface waters

Until 1989, the Republican Hydro meteorological Institute in Sarajevo performed the regular water quality control in the watercourses in Bosnia Herzegovina. The quality of water at reference stations in the Republic of Croatia is monitored by Hrvatske vode.

The quality of water is at present systematically monitored on the following watercourses:

- in the Neretva basin: the Neretva, the Trebižat, the Vrljika, the Jasenica and the Lištica, Matica, Baćinska jezera and Norin spring
- in the Trebišnjica basin: the Mušnica in Gatačko Polje, Bilećko jezero, the Gorica balancing reservoir and the Trebišnjica.

On the basis of inadequate physic-chemical indicators (conductivity, oxygen, redox, turbidity and nitrate), the water from the upper and central Neretva basin and from the lower part of the basin bordering on the Republic of Croatia meets the prescribed criteria for water class II. The Trebižat, Jasenica and Lištica waters also comply with the prescribed water quality in accordance with the above-mentioned parameters.

Water in the Neretva on the Metković and Opuzen areas (the territory of the Republic of Croatia) is of a lesser quality than the prescribed water class II due to increased values of electric conductivity and microbiological indicators, on the area of Matica and Baćinska jezera due to an increased value of microbiological indicators, and in the Norin spring due to an increased value of electric conductivity. The values indicating the oxygen regime and nutrients in the Croatian part of the Neretva course meet the prescribed criteria.

According to the physico-chemical indicators of water quality, the waters from the Bileća storage lake, the Gorica balancing reservoir, and the Trebišnjica upstream of the wastewater treatment plant belong to water class I with occasional changeover into water class II. The waters from the Trebišnjica downstream of the wastewater treatment plant belong to water class III, particularly at a time of low water level. However, the above-mentioned waters are loaded with bacteria and according to that parameter do not meet the criteria for water class II.

3.4.2.1. Water quality in proposed WWTPs

Data on water quality in proposed WWTPs, if available, are presented below.

1) Konjic municipal wastewater

Recipient of the wastewater from the city is Neretva River, which, according to the Decree on the Water Classification (Official Gazette, number 2/67) belongs to the Category II of the water streams, and as such may be used for: swimming, water sports, fish farming, and with adequate filters could be used for drinking and supplying of the industry. Wastewaters, which flow into some water flow, should not change the proper class of the water stream after they flow into it. Basic values of the parameters, which should be met in case of a Class II water supply system, after the wastewaters are discharged, are as follows:

a) Suspended solids, not more than 30 mg/l;
b) Total evaporation residue, not more than 1000 mg/l;
c) Dissolved oxygen, at least 6 mg O2 /l;
d) BOD5, nor more than 4 mg/l;
e) pH value 6.8 – 8.5

The quality of wastewater of the city of Konjic deviates from these values. Table 3.1. below gives an average value analysis of the Konjic wastewater.

Table 3.1.: Analyses of wastewater bulk parameters in Konjic

Parameters	Household	Small business	Industry	Institutions
Turbidity (NTU)	28	95	17	700
pH value	7.59	7.78	7.05	6.79
Total evaporation residue at 105°C (mg/l)	318	780	352	2,748
Ashes at 550°C (mg/l)	162	348	134	558

Parameters	Household	Small business	Industry	Institutions
Volatile compounds at 550°C (mg/l)	156	432	218	2,190
Suspended solid substances (mg/l)	62	198	26	1,625
Electrical conductivity at 20°C	536	1583	366	718
m-alkalinity (mg $CaCO_3$/l)	241	506	147	367
n-Kjeldahl (mg N/l)	14.84	96.60	1.68	24.64
Total phosphates (mg P/l)	3.002	5.912	0.525	4.120
COD (mg O_2/l)	106	447	57	976
BOD_5 (mg O_2/l)	33	238	22	370
Toxicology (%)	-	70	30	-
Flow rate Q (m^3/day)	21.75	1.34	166.67	26.67
Water consumption per capita (l/day)	-	-	-	-
Number of inhabitants connected to sewerage network	-	-	-	-
EBS BOD_5	34	9	139	382
EBS (suspended matters) TSS	25	5	79	788
EBS toxicology	0	2	556	0
Total EBS	59	16	774	170
BOD_5 kg/100 m^3	3.3	23.8	2.2	37.0
Suspended solids TSS (kg/100 m^3)	6.2	19.8	2.6	162.5

2) SurTecEurosjaj metallurgy company in Konjic

SUR-Eurosjaj wastewater quality measurements were undertaken in period 18-20 December 2002, according to the methodology for estimation of PE, which is regulated by the law (Regulation on types, range and methodology of wastewater quality measurements – Official Gazette FBiH, no. 48, 28.12.1998).

The measurements estimated the total wastewater load, expressed in population equivalents as PE = 336. Estimation of the total wastewater load was undertaken on a wastewater collector with its daily load of 100% of full capacity. The measurements were undertaken on 18.12.2002. In the working period, sampling was done continuously both on inlet (influent) and outlet (effluent) of the system. In order to obtain a satisfactory accuracy of the time profile of all quantitative and qualitative parameters of the system in shift working regime, the sampling rate was set on 8 hours. The results of these measurements are given in Table 3.2.

Table 3.2: Qualitative and quantitative parameters of process wastewater in SUR-Eurosjaj factory in Konjic

Parameters	Influent	Effluent	Effects of treatment (%)
COD (mg/l)	103	50	51.4
BOD (mg/l)	15	7	53.2
Chlorides (mg/l)	257	15	94.2
Sulphur (mg/l)	135	17	87.4
Detergents (mg/l)	0.8	0.6	25
Phosphates (mg/l)	22,4	0.24	98,9
Copper (mg/l)	1.58	0.37	76.5
Tin (mg/l)	0.046	0.008	82.6
Lead (mg/l)	0.005	0.003	40
Nickel (mg/l)	-	-	-
Zink (mg/l)	16.1	0.36	97.7
Chrome (mg/l)	0.22	0.14	36.3
Cyanides (mg/l)	0.061	0.009	85.2
Suspended solids (mg/l)	18	14	22.2

Properly treated wastewater discharged from the treatment plant will have the following characteristics:

Table 3.3.: Chemical structure of outlet water from WWTP at SurTecEurosjaj

Item no.	Description	Permissible concentration (mg/l)		Expected concentration	Comment
1.	Chrome Cr^{3+}	0.1	0.5	0.05	
2.	Nickel Ni^{2+}	0.05	0.1	0.04	
3.	Copper Co^{2+}	0.01	0.1	0.1	
4.	Zinc Zn^{2+}	0.2	1.0	0.1	
5.	Cyanides CN^{-}	0.1	0.1	0.05	
6.	Iron Fe^{2+}	0.3	1.0	0.2	
7.	pH level	6.8-8.5	6.0-9.0	6.5-8.0	
8.*	Sodium Na^{+}				Not prescribed
9.*	Chlorides Cl^{-}				Not prescribed
10.*	Calcium Ca^{2+}				Not prescribed
11.*	Sulphates				Not prescribed
12.	HCO_{3-}; CO_3^{2-}				Not prescribed

* Defined in terms of evaporation residue and heating losses

** Permissible concentrations are given with respect to the recipient and class of water and expected concentrations are given for the facility outlet.

3) UNISGAL metallurgy company in Konjic

Testing of wastewaters is conducted daily in company's own Laboratory and the test data are logged. The chemical analysis is performed by a spectrophotometer, and besides chemical
parameters, physical parameters such as flow rate, temperature, conductivity are determined.

In addition to company's own testing, wastewater is also tested by the „Public health institute Mostar" that issues a report on the efficiency of the wastewater treatment. Results of such test are given in Table 3.4. below. Based on the report, and according to the regulations, wastewater exits the neutralization tank before entering the recipient water flow contain parameters in the following ranges:

- BOD_5 < 50 mg/l;
- COD < 150 mg/l;
- Suspended substances 60 mg/l;
- pH–value 6.5–8.5.

Table 3.4.: Quantitative and qualitative parameters of Wastewater Treatment Plant UNISGAL

Parameters	Values
pH	8.05
Water temperature (°C)	11.3
Turbidity (NTU)	4.15
Electrical conductivity (μS/cm)	420
COD (mg O_2/l)	47
BOD (mg/l)	12
Sulphur (mg/l)	13
Residual after evaporation (mg/l)	198
Suspended solids (mg/l)	9
Phosphate (mg/l)	0.15
Copper (mg/l)	0.20
Iron (mg/l)	1.11
Zinc (mg/l)	0.79
Chrome (mg/l)	0.02
Cyanides (mg/l)	0.009
Detergents (mg/l)	1.0

Here it was showed the application of a completely new method of wastewater treatment, which has a number of advantages in comparison to the ion exchanger method, and especially in comparison with the current method. This new method of wastewater treatment in comparison to the ion exchanger method or in comparison to the current method shows following improvements:

- Cross-contamination deficiency is removed;
- Each wastewater flow is separately treated;
- Higher degree of wastewater purification;
- Lesser amount of precipitated sediment after treatment;
- Reduction of wastewater flow rates;
- Complete automation of the wastewater treatment process which greatly reduces the possibility of human error;
- Possibility of phased system implementation depending on available funds;
- Unlike the current system, this method treats at the start and not at the end of the pipe.

4) Ljubuški municipal wastewater

Public enterprise JKP "Ljubuški" is responsible for management of the water supply system and wastewater treatment in the Ljubuški municipality. Department "Water supply, sewage system and wastewater treatment" is operational within the Public enterprise. It consists of separate units for maintenance of water supply system, maintenance of sewage system, wastewater treatment, water quality control and pumping stations. Results of water quality control are given in Table 3.5. below. Wastewater treatment plant is operating under this department along with the laboratory for water quality control.

Table 3.5: Qualitative and quantitative parameters of the effluent and influent WWTP Ljubuški (kg/day)

Parameters	Influent			Effluent			Mean values		Effects
	Month			Month			Influent	Effluent	%
	06/2005	07/2005	08/2005	06/2005	07/2005	08/2005			
Alkalinity ($CaCO_3$)	100.896	142.620	135.787	102.047	105.793	108.740	126.434	105.527	16.5
KPK	76.339	64.307	56.310	27.927	38.821	23.061	65.652	29.936	54.4
BOD_5	31.185	42.067	39.575	15.063	17.820	14.563	39.609	15.816	60.1
Nitrogen (N)	4.333	4.672	4.900	1.513	0.790	0.772	4.635	1.025	77.9
Total Nitrogen	2.113	1.892	1.793	0.922	1.145	1.298	1.933	1.119	42.1
Nitrites	0.064	0.180	0.322	0.118	0.649	1.123	0.189	0.63	+233.3
Nitrates	1.413	1.591	1.107	4.219	5.388	5.352	1.370	4.986	+263.9
Total phosphor (P)	4.659	4.407	3.731	3.527	4.181	4.381	4.266	4.030	5.5
Dry residue at 105°C	158.881	223.913	228.303	145.523	234.753	208.443	203.699	196.240	3.7
Ashes at 550°C	76.379	98.973	164.233	64.938	88.580	120.992	113.195	91.503	19.2
Volatile at 550°C	82.502	124.940	64.070	80.585	146.173	87.451	90.504	104.736	+15.7
Suspended solids at 105°C	18.326	17.923	20.307	12.646	5.867	7.475	18.525	8.663	53.2
Dissolved at 550°C	140.554	205.990	207.997	132.877	228.886	200.968	184.847	187.577	+1.5
Flow (m^3/24 h)	1,050	1,310	1,340	1,050	1,310	1,340			

5) Bileća and Trebinje

Table 3.6. below summarizes the flow rates of municipal wastewaters into Bilećko lake from municipalities Trebinje and Bileća, due to the fact that their municipal water supply takes water from the Bilećko lake, close to the wastewater discharge point.

Table 3.6.: Estimated flow rates of household wastewaters

From households	Trebinje			Bileća		
	Sewage	Diffusion	Sum	Sewage	Diffusion	Sum
COD as $KmnO_4$ (kg/year)	135,000	135,000	270,000	49,500	49,500	99,000
BOD_5 (kg/year)	225,000	225,000	450,000	82,500	82,500	165,000
SM (kg/year)	270,000	270,000	540,000	99,000	99,000	198,000
Total Nitrogen (kg/year)	45,000	45,000	90,000	16,500	16,500	33,000
Total phosphor (kg/year)	9,000	9,000	18,000	3,300	3,300	6,600
Chlorides (kg/year)	324,000	324,000	648,000	118,800	118,800	237,600
Cyanides (kg/year)	31.5	31.5	63	11.55	11.55	23.10
Led (kg/year)	58.5	58.5	117	21.45	21.45	42.9

Expected quality of treated water from Bileća municipality using modern variant based on conventional technology of biological treatments as follows:

Table 3.7: Expected quality of treated water

Parameter	Results of treatment
BOD_5	< 10 mg O_2/l
Suspended solids	< 20 mg/l
NH4-N	Removal rate > 90%
Total nitrogen N	Removal rate > 70%
Total phosphor P	Removal rate > 60%

3.4.3. Activities affecting the hydrological regime and a change of the general ecological function of water

The Neretva and Trebišnjica Rivers and their surroundings have been under the influence of various human activities for a long time, particularly after the 1950-ies. Particularly remarkable are the activities related with:

- a change in the natural flow regime and a disturbance in the settling of alluvium
- amelioration, or a conversion of large wetland areas into arable agricultural land
- a transposal of waters from one sub-basin into another sub-basin by the construction of a duct network
- the obstruction of rivers with the purpose of exploiting their energetic hydropotential
- intensive monocultural agricultural production, more and more accompanied by the use of agrochemicals, i.e. a change in traditional cultivation of field crops
- inadequate use
- uncontrolled disposal of household/industrial waste

- the discharge of untreated communal and industrial wastewater into the watercourses and the underground
- the exploitation of mineral raw materials.

However, in this chapter we shall deal only with the construction of storage lakes, the performed ameliorations and the exploitation of gravel.

The Neretva basin: Among the storage lakes on the Neretva River, the storage lakes of the Jablanica, Grabovica, Salakovac and Mostar I Hydropower Plants were constructed primarily for the production of electricity. The Rama Hydropower Plant storage lake was constructed on the Rama, the right tributary of the Neretva.

The Jablanica storage lake, about 24.5 km in length and about 0.59 km in average width, was constructed in 1955. It has an area of ca. 14.4 km^2 and a total capacity of ca. 487.0 x 10^6m^3. The Grabovica storage lake, constructed in 1982, has an area of ca. 1.34 km^2, and a total capacity of 19.77 x 10^6m^3. The Salakovac storage lake was constructed in 1981, with an area of ca. 3,665 km^2, and a total capacity of ca. 68.0 x 10^6m^3. The Mostar I HPP storage lake, constructed in 1987, has an area of ca. 1,908 km^2 and an effective capacity of ca. 10.92 x 10^6m^3. The Rama HPP storage lake was constructed in 1968. It is ca. 7.5 km long and ca. 2.0 km wide on average. It has an area of ca. 14,808 km^2 and an effective capacity of ca. 487.0 x 10^6m^3 (Pehar 2003).

With the purpose of reducing the floods in Imotsko-bekijsko Polje, the Ričica multi-purpose storage and two retarding basins are used in the basin of the Trebižat, the right tributary of the Neretva. The construction of the Ričica storage significantly reduced the intensity of floods in Imotsko-bekijsko Polje, provided water for the irrigation of ca. 8,000 ha of agricultural land, and created preconditions for energetic exploitation of the accumulated water. The total capacity of the storage is 31.0 x 10^6m^3. The Proložac Retarding Basin, constructed on the western part of the field near the settlement of Proložac, has a capacity of ca. 11.4 x 10^6 m^3. Nuga, a former natural retarding basin in the southeastern part of the field with a capacity of 80 x 10^6 m^3, has been used for the purposes of the Peć Mlini HPP since 2004.

Furthermore, a drainage system, i.e. a gravity duct network, has been constructed in the field. The Rastovača Retarding Basin near Posušje, with a capacity of ca. 24 x 10^6m^3, has been constructed for flood protection in Posuško-virsko Polje. Furthermore, the first phase of the Tribistovo storage, with a total capacity of 4.95 x 10^6m^3, has been constructed near Posušje for water supply needs and flood protection of this field and downstream horizons. There are plans for the construction of the second phase of the Tribistovo storage, with the purpose of supplying water to the wider region.

The Služanj Retarding Basin, with a capacity of ca. 5.20 x 10^6m^3, was constructed for the protection of the field of Brotnjo (Čitluk) from floods (Pejaković 2003). A tunnel with a capacity of 60 m^3/s was constructed with the purpose of draining Vrgorsko Polje; the tunnel conveys the waters into Baćinska Lakes, from where they are conveyed into the sea through another tunnel.

The regulation of the Neretva at a section from Metković to the sea, carried out with the purpose of ensuring the navigability of the Neretva to the port of Metković, had a significant impact on the hydrological regime of the Neretva delta. Intensive meliorative works which began in the 1960-ies in accordance with the decision reached by the FAO in 1963 had the same impact. As a result of these works, the total water surfaces which once amounted to around 80% of the entire delta area, amount today to only around 25%. Since

the entire area is markedly low in relation to the mean sea level, the drainage of precipitation water was resolved by the construction of several pumping stations. The main non-meliorated areas are located at a stretch Vid – Norin, as well as on the Kuti area. However, the melioration of the Kuti area began in 1978, ceased in 1980, continued in 1986, only to cease again in 1990. The flood protection facilities have been around 80% complete (Ćavar. S. 2001).

According to a study entitled *The Hydroenergetic Exploitation of the Upper Neretva* (Sarajevo 1984), the following storages are planned to be constructed on the Neretva upstream of Konjic:

- Konjic capacity 75 x 10^6 m^3
- Glavatičevo capacity 157 x 10^6 m^3
- Ljubača capacity 62 x 10^6 m^3
- Ulog capacity 389 x 10^6 m^3

However, following the preparation of preliminary designs for the Konjic Storage in 1985 and the Glavatičevo Storage in 1989, the following effective capacities of the storages were adopted: the Konjic storage: 69 x 10^6 m^3, the Glavatičevo Storage: 157 x 10^6 m^3 prior to the construction of the Ljubača and Ulog Storages, and 55 x 10^6 m^3 after the construction of the Ljubača and Ulog Storages.

The construction of the Glavatičevo Storage with a capacity of 157 x 10^6 m^3 would lead to a significant increase in the minimum flow of the Neretva near Jablanica, unlike the construction of the Glavatičevo Storage with a capacity of 55 x 10^6 m^3. This is related with abandoning the construction of the Ljubača and Ulog Storages.

The rest of the Neretva basin has been considered in relation with the needs and possibilities of constructing the following storages:

- storages on the lower course of the Neretva:
- Buna capacity 1.0 x 10^6 m^3
- Počitelj capacity 6.5 x 10^6 m^3
- Mostar II
- storages on the Trebižat
- Klokun capacity 26 x 10^6 m^3
- storages on the Lištica
- Dubrava capacity 6.0 x 10^6 m^3

The projects for energetic exploitation of water from Mostarsko blato for the needs of the Mostarsko blato HPP are in the process of preparation.

The exploitation of gravel results not only in an increased deepening of the riverbed, but also in the reduction of groundwater levels in the hinterland and in increased salinization of the delta. Gravel is exploited from the Neretva mostly in the Čapljina area.

The Trebišnjca Basin: Storage lakes constructed on the Trebišnjica River primarily with the purpose of the production of electricity, reduction of floods in Popovo Polje and water supply are the Bileća storage lake serving the Trebinje I HPP and the Gorica storage lake serving the Trebinje II HPP and partly the Dubrovnik HPP.

The Bileća storage lake dates from 1969, when a dam was constructed on the Trebišnjica some 17 km upstream of Trebinje in the Grančarevo region. It is ca. 18 km long, with an area of ca. 2,020 ha and a total capacity of ca. 1,280 x 10^6 m^3. The Gorica balancing reservoir was formed with the construction of the Gorica Dam 13.5 km downstream of Trebinje. It is used for the daily balancing of the waters from the Trebinje HPP and from the Sušnica, the tributary of the Trebišnjica. It is ca. 13.5 km long, with an area of ca. 150 ha and a total capacity of ca. 15.6 x 10^6 m^3.

It had been decided that the biological minimum of ca. 8 m^3 of water is to be discharged from the Bileća storage lake into the Trebišnjica riverbed downstream of the Gorica Dam. As these waters used to sink underground on their way through Popovo Polje, a 68 km long canal was constructed in the field in 1978. The canal was constructed for energetic exploitation of these waters in the Čapljina HPP and for the irrigation of Popovo Polje, which used to flood regularly before 1978. The facilities of the Čapljina HPP occupy a part of the Hutovo Blato wetland, which belongs to the lower Neretva basin.

Several significant water management facilities constructed in the karst fields of eastern Herzegovina prior to the construction of the existing HPPs on the Trebišnjica are the Klinje storage on the Mušnica watercourse (constructed in 1898) and several smaller HPPs which are no longer operational. The Klinje storage was constructed for the irrigation of Gatačko Polje, whose irrigation system has been neglected for a long time.

According to The Report on the Construction Impact of the System of Multi-purpose Use of Water from "Upper Horizons" of Eastern Herzegovina on the Trebišnjica and Neretva Water Regimes (Trebinje 2004.), there is a plan of constructing several storage lakes in eastern Herzegovina in the second stage of the realisation of the "Trebišnjica Hydrosystem" Project, all with the purpose of spatial and temporal redistribution of runoff and the protection of karst fields from floods.

The spatial redistribution, i.e. the transposition of waters from the Neretva basin into the Trebišnjica basin, would be achieved by constructing a tunnel between the fields of Nevesinjsko, Dabarsko and Fatničko Polje, a channel through these fields, and a channel through Bilećko Polje. The first stage would encompass the drainage of Dabarsko Polje and Fatničko Polje and provide energetic exploitation of waters from these fields at the existing Trebinje I, Trebinje II and Dubrovnik HPPs. To that end, a 2.77 km long channel and a 15.6 km long tunnel leading to the Bileća storage would be constructed.

The second stage would consist of the following steps: the transposition of waters from Gatačko Polje into Nevesinjsko Polje, the construction of two dams, which would lead to the formation of two storages in Nevesinjsko Polje, Zalomka and Pošćenje, and the construction of the Nevesinje, Dabar and Bileća HPPs.

One portion of waters from Gatačko Polje, together with waters from the Zalomka watercourse in Nevesinjsko Polje, would be used at the Nevesinje HPP in Nevesinjsko Polje. The construction of the Pošćenje Dam would entail the formation of the Nevesinje Storage, whose water would be used at the Dabar HPP. Apart from energetic exploitation, water from both storages would be used for the irrigation of Nevesinjsko Polje, Dabarsko Polje and Fatničko Polje. However, the original plan was to construct the irrigation system of these fields only 20 years after the construction of the intended hydropower plants (*The Karst fields of Eastern Herzegovina*, 1967).

Water used at the Dabar HPP would be conveyed via a tunnel to Fatničko Polje, and futher through channels and tunnels into the Bileća Storage. The Bileća HPP is planned to be constructed at the end of a water transfer tunnel.

The planned storages have the following capacities:

- Zalomka 185.5 x 10^6 m^3
- Poščenje 61.8 x 10^6 m^3

Among other facilities in eastern Herzegovina, the Gacko Thermal Power Plant might have a considerably negative impact on the Trebišnjica basin.

3.4.4. General morphological features

The Neretva and Trebišnjica basin represents a unique morphological body in the central part of the Dinaric Alps in terms of its origin, individual relief elements, shape, length and geographical location.

In morph metric terms the NTRB is characterized by a richly articulated relief. The terrain slopes the most in gorges and transitional surfaces towards mountains, while it slopes the least in ravines and depressions between the mountains.

Among the numerous karst fields in the NTRB, the most important ones are located in the middle part of the course.

In the lower part of the NTRB there sticks out the Neretva delta. The Croatian part of the delta was included into the Ramsar List in 1993. The most important part of the delta in Bosnia-Herzegovina belongs to the Hutovo Blato Nature Park, which has been on the Ramsar List since 2001.

Intensive amelioration, which began in the Neretva delta in the 1960-ies, has reduced its total water surface from 80% to the current 25%.

In terms of its origin, individual relief elements, shape, length and geographical location, the Trebišnjica River basin, just as the Neretva River basin, represents a typical karst region, i.e. a unique morphological body located in the south-eastern part of the Dinaric Alps.

The relief of the NTRB is basically made of karstic mountainous massifs, karst fields, and numerous canyons and gorges with periodical and permanent watercourses. The mountains are mostly rocky, largely without forest vegetation.

The region is characterized by the morphological forms typical of karst, such as karrens, funnel-shaped sinkholes, dry valleys, shafts, caves, and karst fields.

Among many karst fields in the Trebišnjica basin with numerous springs, swallets and estavelles on their edges, Popovo Polje is particularly prominent. Popovo Polje is located in the lower part of the Trebišnjica basin. It would flood regularly prior to the construction of hydropower plants on the Trebišnjica. It used to connect the Trebišnjica with the sea over numerous springs by the sea, as well as with the Neretva over Hutovo blato and the springs near Metković.

3.5. Seismology

Area of NTRB is very seismological active area, with frequent occurrences of earth quakes. Maximum expected earthquake intensity ranges from 7-10 MCS. In terms of seismicity, Dubrovnik Region is the most active region in the Balkan.

Project foresees networking of all seismology station in Project region, in order to monitor seismology activities.

Seismic area of Herzegovina (Ljubinje) is located in a zone with maximum degree of seismic intensity created by earthquake in 1927, from the local focal point intensity of which was Io= 8^o MCS in epicenter, magnitude M= 6,0.

Besides earthquake from local focal point, this area was influenced by earthquakes in neighboring countries, especially earthquake from Montenegro 1979, whose intensity in epicenter was Io= 9^{o} MCS, magnitude M= 7,1 and earthquakes from Croatia, especially from the focal point Imotsko (earthquake in 1923, Io = 8-9^{o} MCS, magnitude M= 6,2).

A large earthquake could cause hundreds of deaths and lasting damage the economic base. They could spawn hazardous materials spills, landslides, conflagrations and seiches. Each of these secondary events would cause additional damage and casualties. Impacts of Earthquake are:

- Disruption of normal Life.
- Losing of lives, livelihoods and property.
- Loss of housing.
- Damage to infrastructure
- Disruption of transport and communication
- Disruption of marketing systems.
- Breakdown of social order
- Loss of business
- Loss of industrial output

3.6. Social Assessment

Of the total population living in the project region, 90% live in BiH, with most of them (78%) living in the FBiH. In BiH, poverty and unemployment are high. Economic conditions are better in the Croatia section of the Neretva River Watershed, but there too depopulation, aging population, and lack of economic opportunities characterize the area. While the population generally is aware of the importance of the integrity of water resources and their related ecosystems to the economic development of the region, and recognize the degradation that is occurring, they feel powerless to influence the decision-making.

Approximately 430,000 people inhabit the NTRB of which less than 10% reside in Croatia. In BiH, the population is primarily rural and poor. Although the return process continues, the number of population is in decline. Almost 18% of the population is under age of 15 and almost 14% is over age of 65. Prior to the recent war, the towns in the NTRB were fairly multicultural, however the cultural demography has changed and now towns are dominated by a single majority ethnic group. The transition and war caused new reasons for poverty in the NTRB, including high unemployment rate, economic emigration and related loss of technical expertise and aging population. The unemployment rate varies between 26 and 46%. Over 60% of respondents to the household survey have other sources of income to support their families, primarily receiving aid from family members.

Participation of citizens and interest groups is low throughout the NTRB and there is a lack of civil representation in decision-making structures; lack of awareness about citizen rights; and lack of knowledge about mechanisms and processes available to protect them.

The capacity of environmental groups and networks, with only a few exceptions, is limited. The social assessment identified that local communities feel disconnected from the decision making process. The lack of community input into and control over decision-making is accompanied by a lack of sense of local ownership. The household survey found that there is little participation at the grass roots level in community organizations, in particular relating to water and land issues.

The social assessment identified an overarching desire of local communities to be able to increase their input and control over decision-making on issues, which affect their lives. There is a high level of agreement on key issues throughout the watershed. The three priority areas for action identified are:

- Improve environmental quality especially regarding water resource management
- Build economic capacity
- Strengthen historical and cultural traditions.

Of 205 individual stakeholders surveyed, no one has ever participated in either land or water management, and overall, only 14% expressed interest in doing so if offered the opportunity. The SA indicated that stakeholders throughout the watershed are concerned about resource limitation and environmental degradation. Stakeholders are concerned that environmental degradation will affect the potential for economic development through agriculture and tourism. Many have expressed feeling of lack of self-esteem that results from living in a litter-strewn environment.

The household survey found that water was perceived as the most precious natural resource in the NTRB by 42% of respondents, while 39% responded forests were most precious. Consultation with community based and government organizations identified the supply of good quality potable water and agriculture as serious and pressing issues in most parts of the watershed.

4. IDENTIFIED ENVIRONMENTAL IMPACTS

4.1 Impacts during construction

Short-term impacts on the environment, i.e. immediate surrounding of the site, could be expected to occur during the construction or future decommissioning activities. Noise, vibration, dust and construction wastes could be generated during construction, while land quality may be affected and vegetation destroyed during the works. It is also important to emphasize that there is certain probability of chance findings of cultural heritage items or mass graves during excavation or construction activities.
In particular, the principles given in Mitigation measures in next chapter should be followed – see below.
Proposed project activities are relatively small in scale so that negative impact on environment during the construction works will be minimal.

4.2. Changes in Land Use

Change in land use is one of the impacts that is permanent, and can be mitigated in one of the following ways applicable to this project:

- construct collectors and plants on public owned land,
- use locations of former wastewater treatment plants if applicable
- use locations within possible industrial zones

In the project foreseen activities are relatively small in scale so that limited changes in land use could be expected.

4.3. Noise and Vibration

Noise and vibration may occur both during the construction and during the later plant operation phases. During the construction and decommissioning phases, noise and vibration occur as a result of the increased traffic and construction works, such as compaction, excavation, drilling or mechanical digging.

However, proper scheduling of the construction activities can substantially reduce the noise and vibration impacts, by limiting them to regular daytime periods. Additionally, all transport to and from the site with larger vehicles should be adapted to the local traffic flow of the daytime periods given.

During the plant operation, the noise levels produced should be maintained within acceptable limits.

4.4. Odour

Unpleasant odour is an unavoidable issue during wastewater treatment, due to a number of gasses produced and emitted, such as hydrogen sulphide. Since this odour cannot be avoided, it can be minimized by means of buffer zones around the treatment plant, or costly installation of odour control equipment.

During normal operation, no significant odour problems should arise, unless there is a

malfunction that can make the sewage or sludge become septic and emit strong odours. It is important to ensure disposal of solids and wastes on an appropriate disposal site, such as a sanitary landfill, in a way described in Mitigation plans given in Chapter 5.

The overall effect of the project shall result in a long-term reduction of certain problems, such as odour release from the open water bodies in the project area.

4.5. Impact on Population and Development

This project will create new work places during the construction phase and the later plant operation, maintenance and management. The establishment of appropriate wastewater collection and treatment systems will help overcome substantial urban development barriers, and therefore this project will facilitate further construction within the urban areas.

4.6. Impact on Historical Sites

No impacts on historical sites or cultural heritage objects are expected on the locations of the identified four project components. All construction works and activities are planned outside areas with cultural heritage. However, even though unlikely, chance findings of archaeological sites or mass graves during the construction activities cannot be ruled out.

4.7. Impact on Surface and Ground Water

The project is expected to have a direct positive effect on the surface water quality, especially in the water bodies that have been the recipients of raw sewage. This will particularly be reflected in the achievement of more acceptable BOD (biological oxygen demand) values for the recipient, as well as significant reduction of microbiological and nutrient pollution on all project locations. This positive effect will depend on the plant efficiency.

4.8. Impact on Agriculture

No negative impact on agriculture is expected.

If the sludge from the treatment plant is adequately treated, it can be used in agriculture as fertilizer, while disinfected effluent can be used for irrigation. As a result, the agricultural activities can be intensified, or provided potential to develop while preserving natural resources.

However, it is important to note that the quality of the sludge and effluent needs to be carefully and continuously monitored in case of their agricultural use, in order to prevent toxic levels of heavy metals or pathogenic microbes in crops. Along with the monitoring system, the agricultural workers would need to be trained.

4.9. Impact on Health

When considering that the rivers and other watercourses in BiH are used for drinking water supply, irrigation and recreational purposes, it is evident that the release of untreated wastewater can cause significant concern, especially with regards to public health.
Through collection and adequate treatment of wastewater, the quantities of raw sewage released into the watercourses will be reduced. As an immediate result, the amount of

pathogenic micro organisms and polluting constituents is expected to be decreased, thus reducing the chances of disease occurrence either through drinking water, irrigation of crops or direct contact.

4.10. Adverse Impacts on Natural Environment

No negative impacts on natural environment are expected in relation to this project. Following the adequate mitigation measures recommended in Chapter 5, the project is expected to have a positive overall effect on the nature.

Thus improvement of water quality in the watercourses concerned is expected, which will in turn help preserve and protect the biodiversity and ecosystems.

5. ENVIRONMENTAL MANAGEMENT PLAN

5.1. General aspects

Each of the sub-components listed above have its own specifics, but it can be divided in four segments:

- Improving of tourism infrastructure on behalf of Nature protection promotion and valuating
- Improving of waste water systems on behalf of Terrestrial and aquatic habitats protection
- Salt water intrusion
- Small grants

All segments shall be improved or rehabilitated in order to increase level of Nature protection in NTRB. By meeting these aims, the project would also protect the health of general population in the region. Furthermore, through the improving of waste water systems as for sub-components would be placed improvement of Water quality in rivers, lakes and underground waterways and lakes.
According to procedures of BiH and RH, planned activities do not require preparation of EIA, neither praxis foresees preparation of EMP.
However, in this document, an Environmental Management Plan (EMP) is provided for each of the sub-components. The EMP addresses possible environmental issues, which are mostly minor, or are already included in the project implementation itself.

The EMPs contain the following:
- mitigation plan,
- monitoring plan,
- institutional strengthening

In this way, proposed sub-components for improvement of water quality will significantly mitigate impact of wastewater from cities.

Preliminary step during EA procedure was screening process for identification of possible negative environmental impacts and the manner in which these issues could be mitigated. Following the mitigation plan, a monitoring plan comprising all parameters and issues identified in the mitigation plan is provided. These mitigation measures need to be regularly monitored and plants operators have to include monitoring in their working routine, providing continuous supervision through selected control indicator.

Prior to commencement of all activities foreseen within this Project, it is important to note that the majority of possible environmental impacts would occur during the construction phases.

Additionally, it is important to note that all of the issues listed within the EMP as responsibility of the construction or decommission contractor shall be specified within the construction bid documents.

5.2. Sub-components description and affiliated EMPs

For all activities which were determined as subject of EIA, short description, review of legislation requirements and environmental mitigation and monitoring plan are given below and in the tables.
Also, examples of good practice for some selected issues are given in Annex 3 of this Report.

5.2.1. Bileća municipal wastewater collection and treatment infrastructure

Description of current situation: Bileca is a municipality and town in the southeastern part of Bosnia and Herzegovina. Area of the municipality is 633 km², with approximately 15,000 inhabitants, 9,000 of which live in the town of Bileca. The average altitude of Bileca is 476 m above sea level. Mediterranean and continental-mountainous climates meet on the territory of Bileca. The landscape is hilly with karstic fields: Dabarsko, Fatničko, Plansko and Bilećko fields. South of Bileca the spring of Trebisnjica River is located. In 1996, a hydroelectric power plant was built and one of the largest accumulation lakes in the world was founded, Bilećko Lake, 18 km long and 3-4 km wide.

The existing wastewater collection system in Bileca is incomplete and covers only the central part of the urban area. Around 50% of consumers are connected to the sewage system, (approx. 1,300 households), and the rest are connected to septic tanks which are freely discharged in to the ground and probably infiltrate into Bilecko Lake. There are two collectors in the town area. Collector no.1, with a 300 mm diameter, covers the town area above the following streets: Obilićev vijenac, Kralja Aleksandra, Srpske vojske and a section of the regional road to the wastewater treatment facility Drakuljice. Collector no.2, with a 500 mm diameter runs through the town area Grabovica and army barracks "Srpska vojska" and connects with the collector no.1 near southern gates of the army barracks. This collector is used to collect wastewater from the buildings located between the bus station and the army barracks, i.e. from buildings that are lower than collector no.1. Due to the small diameter of collector no.1 it is often clogged and wastewater freely overflows, most frequently between the collector no.1 connection site and the treatment facility. Parts of town located at lower altitudes, which are not connected to the sewage system, use septic tanks, which are improperly built, leak or are in direct contact with the groundwater. The wastewater treatment facility Drakuljice, built in 1967, is sized to handle 10,000 PE and was meant to treat household wastewater and pre-treated industrial wastewater. However, the filtration system with two manual grates, two primary sedimentation tanks, a biological filter, two secondary sedimentation tanks and a contact chlorination tank has been out of service for over twenty years. Wastewater is freely discharged at the facility and flows untreated into Bilećko Lake close to the water supply intake. Since the lake has a multifunctional character and its water supplies municipalities Bileća, Trebinje, Nikšić, Dubrovnik, Herceg Novi and Čapljina, it is evident that the wastewater of Bileca represents a regional problem.

Industrial wastewater treatment system of the carpet factory "Bilećanka" was built in 1962 with only equalization tanks as a treatment method, until 1976 when a new facility offering the complete wastewater treatment was built. That system consisted of two treatment lines: one for treatment of dyed water and one for treatment of wool rinse. The treatment facility was fully operational until the beginning of the war in 1992, and in 1993, it was put out of operation. After that the untreated wastewater is being freely discharged into the underground from where they can flow into the Bilećko Lake.

The basic structure of the treatment facility is preserved, but in order to be operational, a general rehabilitation is needed. A collection system for precipitation runoff practically does not exist; it is only in place in the "Solunskih dobrovoljaca" street and partially in the "Kralja Aleksandra" street. Precipitation sewage waters discharge into Bilećko Lake occurs close to the water supply intake.

Before preparation of Main Project, it is necessary to analyse alternative treatment solutions, especially constructed wetlands.

Description of activity: (Technical proposals for the facilities) In July 2004 the Bileca Municipality ordered from the CUV-BL company a technical audit of the main project of reconstruction of Bileca wastewater treatment facility including proposals for further actions; with the project coordinator Prof. Dr. Čedo Maksimović. The technical audit was performed based on the project documentation that deals with the reconstruction of the existing Bileca wastewater treatment facility. Technical documentation, which served as a basis for the technical audit, consisted of a report in which the lead designer replied to previous remarks made about the project documentation originally made in 1988. The graphical documentation, which is an integral part of the aforementioned documentation, helped clarify the concept of the designed treatment process, but without the required detail.
Based on the audit and the quality assessment of the proposed solution, it was concluded that the project could not be used as a basis for the construction of the wastewater treatment facility for the two main reasons:

- The project documentation was made a long time ago, and the proposed solution is technologically out-of-date; and
- A number of deficiencies were found in the documentation, but all corrections were ceased due to the first reason.

As a result, a new project with modern technological solutions is the recommended solution. This means that the facility, upon completion, could operate optimally and in accordance with the latest achievements in the area of environmental protection. The two concepts have been analysed within this document:

Proposal 1: Up to date version based on conventional technology
Proposal 2: Solution with a membrane bioreactor

Modern version based on conventional technology. The solution is based on the concept of extended aeration, where bio-aeration and aerobic stabilization of sludge occur in one-step, in the same bio-aeration tank. Activated sludge, which settles after bio-aeration is completely biologically stabilized and can be safely disposed on the landfill or applied onto the land. In addition, the pumping station for transportation of sludge from bio-aeration into the stabilization tank is not needed. Process control is simple, the process is flexible with respect to the flow rate variation and wastewater quality, and it results in a very stable effluent quality. Depth aeration implies blowing of compressed air through a pipeline to membrane diffusers, which are installed at the bottom of bio-aeration tank. The optimal tank depth is 4.5 m (i.e. depth of water in the tank). Air bubbles of average diameter of 2 mm or less, enable a more efficient transfer of oxygen into the water.

Diffusion is not the key transfer mechanism here, but the developed turbulence caused by intensive barbotation of the entire water in the tank (no dead zones). Such a treatment device, like the classical one, requires mechanical treatment and usage of an

aerated sand trap. Disinfections of the treated water can be done by UV light, which is a convenient alternative to gaseous chlorine and has a number of advantages such as lack of residuals that could harm the ecosystem of the recipient. The proposed solution encompasses a sludge silo, centrifugal pumps that transport the condensed sludge to a band filter press, and sludge conditioning through addition of a solution of appropriate polyelectrolyte. Strained matter is gravitationally returned from the press to the start of the treatment process.
Solution with a membrane bioreactor. This technology has been recently improved in Germany and has been applied in several treatment facilities in that country. The relative novelty technology may offer the possibility to receive some of the equipment as a donation while the facility could be used as a demonstration facility for the region.

Remark: Proposal no. 1. results in excellent effluent characteristics. It would not be rational to build such a facility with a capacity below 20,000 PE, which exceeds current needs. The second limiting factor is the price which would not be below 2,000,000.00 € and the surface area required for the plant is 10,000 m2.

Mitigation Plan and Environmental Management Plan

Mitigation Plan and Environmental Monitoring Plan for activities to be performed in Bileća concerning wastewater treatment are given in Tables 5.1. and 5.2. below.

Table 5.1.: Mitigation Plan for Municipal Wastewater Treatment System Bileća

Phase	Action	Mitigation measures	Remarks	Cost / KM	Institutional Responsibility
Construction	Construction activities may lead to traffic disruptions and congestions.	Clearly display informative/warning signs around construction area. Limit construction works to regular time intervals. Allocate possible alternative traffic routes (diversions). Minimize vegetation clearing for new roads.	Part of sub component activates may be in urban area and part in the rural area. New roads for works and WWTP access may be needed.	Included in construction costs	Contractor – to be selected in the Public procurement procedure
Construction	Construction activities may affect traffic safety.	Clearly display informative/warning signs around construction area. Limit construction works to regular time intervals. Allocate possible alternative traffic routes (diversions).		Included in construction costs	Contractor – to be selected in the Public procurement procedure
Construction	Damage of trees and other vegetation during construction activities	Minimize vegetation clearing. Prevention of erosion, especially on big gravels sites. Restore and reforest all damaged trees or vegetation after completion of works.	Roots of the trees may be severally damaged during construction works.	Included in construction costs	Contractor and Environment or Civil engineer supervisor - to be selected in the Public procurement procedure

Table 5.1.: Mitigation Plan for Municipal Wastewater Treatment System Bileća

Phase	Action	Mitigation measures	Remarks	Cost / KM	Institutional Responsibility
Construction	Construction works may generate temporary higher concentrations of dust.	Reduce dust generated by traffic to the extent possible. If possible, use closed or covered trucks for transportation of construction materials. Sprinkle earth with water to prevent dust generation (especially in dry season), remove excess materials and clean sites upon completion of activities.		Minor/Included in construction costs	Contractor and Environment or Civil engineer supervisor – to be selected in the Public procurement procedure
Construction	Noise and vibration disturbances due to construction works	Limit construction activities to regular daytime intervals. Establish schedule and/or other specific restrictions on works. If necessary, use noise barriers and/or noise suppressors on equipment.		Minor/Included in construction costs	Contractor and Environment or Civil engineer supervisor – to be selected in the Public procurement procedure
Construction	Temporary interruptions in waste water lines	Providing temporary wastewater pipelines and by pass if needed.		Minor, included in construction costs	Constructor - to be selected in the Public procurement procedure, WWTP Operator (Public Communal Company Water management and Canalisation) and Municipality of Bileća

Table 5.1.: Mitigation Plan for Municipal Wastewater Treatment System Bileća

Phase	Action	Mitigation measures	Remarks	Cost / KM	Institutional Responsibility
Construction	Removed material and/or construction wastes may pose an environmental threat if not disposed of properly, especially if hazardous. Special attention needs to be paid to removed asbestos-cement pipes .	All non-hazardous construction wastes need to be disposed of in an environmentally sound manner. Earth, rock and cut vegetation can be reused or composted, while all non-reusable wastes need to be landfilled at a sanitary landfill. All hazardous wastes need to be handled in accordance with procedures of the Entity Law on Waste Management Prevention of erosion for all materials specially in vicinity of surface water Asbestos, cement pipe remains need to be contained in order to prevent crumbling and generation of air-borne particles, and then disposed.	WB Environmental supervision may be needed. There is no local (BIH or HR) Rules or Laws according asbestos or cement pipes or materials.	Approximate transport costs are 1 KM/ton *km Disposal costs: 80 KM/ton on sanitary landfill, in accordance with given or more convenient conditions.	Municipal environmental inspector (does not exist in this municipality – work to be done by referent for environmental protection in Municipality or by Environmental inspector from Trebinje municipality, Mr. Stevan Bekan since there is currently reform of Inspection taking place in BiH and it is very likely that Mr. Bekan will be in charge of few Municipalities in that region) must ensure all regulations and procedures are met.

Table 5.1.: Mitigation Plan for Municipal Wastewater Treatment System Bileća

Phase	Action	Mitigation measures	Remarks	Cost / KM	Institutional Responsibility
Construction	Fuel, grease and chemicals spillage may cause pollution of surface water, underground waters and soil	Control of equipment and vehicles. Isolate and clean the location in case of spillage. Solidification of spilled liquids using adequate materials. Store fuels, lubricants, coolants, paint, solvents and bitumen safely and handle them cautiously.		Minor/Included in construction works	Contractor – to be selected in the Public procurement procedure. WWTP Operator (Public Communal Company Water management and Canalisation)
Construction	Although unlikely, chance findings of ordnances, cultural heritage items. .	Cease all construction works in the area, contact police/civil protection/authorities. Arrange necessary site preservation measures		Minor	Contractor – to be selected in the Public procurement procedure and Institute for protection of nature monuments and cultural heritage Banjaluka
Start up and operation	Incidental discharge of wastewaters not complying with set quality may endanger surroundings	Continuous control of equipment, regular maintenance of equipment, control of discharged wastewater quality. Develop emergency/accident procedures.		Included in wastewater treatment plant costs (maintenance costs)	WWTP Operator (Public Communal Company Water management and Canalisation) and Municipality of Bileća

Table 5.1.: Mitigation Plan for Municipal Wastewater Treatment System Bileća

Phase	Action	Mitigation measures	Remarks	Cost / KM	Institutional Responsibility
Start up and operation	Production of sludge from wastewater treatment process	Proper disposal of sludge. Establish control of sludge content		Approximate transport and disposal costs are 200 KM/tone	WWTP Operator (Public Communal Company Water management and Canalisation)
	Odour from the treatment plant	Establish continuous treatment plant process control	Control of methane concentration may be needed	Included in the plant and maintenance costs	WWTP Operator (Public Communal Company Water management and Canalisation)
	Improper waste disposal may result in environmental pollution	Establish plan and procedures for waste management. Waste disposal to be performed in environmentally sound way. All non-hazardous waste to be disposed of in a proper way. Eventual occurrence of hazardous waste to be resolved in accordance with law.		Estimation: 1KM/t*km, for transport and 80 KM/t for disposal on sanitary landfill, in accordance with given or more convenient conditions	WWTP Operator (Public Communal Company Water management and Canalisation)

Table 5.2: Environmental Monitoring Plan for Municipal Wastewater Treatment System Bileća							
Phase	**Which parameter is to be monitored**	**Where is the parameter to be monitored**	**How is the parameter to be monitored**	**When is the parameter to be monitored**	**Why is the parameter to be monitored**	**Cost / KM**	**Responsibility**

Table 5.2: Environmental Monitoring Plan for Municipal Wastewater Treatment System Bileća

Phase	Which parameter is to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Construction	Traffic disruptions and congestions, traffic safety	On site, around site	Visual inspection, complaints from neighbours or traffic participants	Regularly during construction, daily or weekly as appropriate	Prevention of disruptions. Population, traffic participants and workers safety.	Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
	Site admittance control	On site, around site	Visual inspection	Daily during construction	Population safety	Negligible	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Table 5.2: Environmental Monitoring Plan for Municipal Wastewater Treatment System Bileća

Phase	Which parameter is to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Construction	Dust generation	On site, around site	Visual inspection, complaints from neighbours, irritation of respiratory system	Daily, or as required during construction	Minimization of dust dissipation in the area, minimization of irritation of respiratory systems of the population and workers.	Minor/Included in construction works	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
	Noise and vibration generation	On site, around site	Aural inspection, complaints from neighbours or workers	Daily, or as required during construction	Minimization of population nuisance, protection of workers health	Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Table 5.2: Environmental Monitoring Plan for Municipal Wastewater Treatment System Bileća

Phase	Which parameter is to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Construction	Waste generation and management	On site	Visual inspection, disposal records or receipts from landfills	Regular daily control	Protection of soil, groundwater, surface waters, aesthetic reasons.	Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Leaks/spills of fuel, lubricants, coolants, paint, solvents and bitumen	On and around site	Visual inspection. In case of frequent and substantial spills or leaks, detailed lab analysis of the contaminated media and water in the system should be conducted	Visual inspection daily during works. Lab analysis as required.	Protection of environment, workers safety.	Should be included in construction costs; cost of additional lab testing: approximately 800 KM	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Table 5.2: Environmental Monitoring Plan for Municipal Wastewater Treatment System Bileća

Phase	Which parameter is to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Construction	Equipment emissions into air	On site, around site	Sensory inspection, air quality meters	Weekly during construction	Population and workers health protection, air quality protection	Portable air emission monitors: approximately 3000 KM	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Cut down damaged trees/vegetation replacement	On site	Visual inspection, photographs prior to start of construction works	Before and after construction works	Natural resources preservation, aesthetic reasons	Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Table 5.2: Environmental Monitoring Plan for Municipal Wastewater Treatment System Bileća

Phase	Which parameter is to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Construction	Chance findings of cultural heritage items	On site, around site	Visual inspection	Daily during construction works	Protection of cultural heritage	Negligible	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Quality of recipient water	On the place of discharge	Laboratory analyses (BOD, COD, SM, TKN)	Before any decision on number of small scale facilities and starting of operations	In order to determine load of recipient and evaluate danger to human health and determine level and type of treatment needed	800 per analysis	WWTP Operator and Referent for environmental protection within Municipality of Bileća

Start up and operations	Quality and quantity of discharged wastewater	On the place of discharge	Laboratory analyses (BOD, COD, SM, TKN) Monitoring with portable water quality equipment	Laboratory analyses periodically. Monitoring with portable water quality equipment to be performed daily, during plant operation	To prevent pollution of recipient	- Minimum 3000 KM per analysis, - once in two years PE calculation - costs according Water management company regulation; - 2500 KM for portable monitoring equipment	Referent for environmental protection within Municipality and WWTP operator (Public Communal Company Water management and Canalisation)
Start up and operations	Chlorination level	On site, chlorination station/unit	Chlorine dozers, measurement of chlorine, content in treated wastewater	Measurement of chlorine content in treated wastewater in accordance with chlorine dozing regime (continuous or batch-wise)	Protection of recipient flora and fauna	Included in operational costs (chlorination dozer: approximately 400 KM; chlorine-in-water meter: approximately 300 KM	WWTP Operator (Public Communal Company Water management and Canalisation)
	Disposal/treatment of residual solid products (sludge) from WWTP	On site, around site	Visual inspection, laboratory analyses	Every batch, in accordance with internal sludge management plan	Prevention of environmental pollution	Included in operational costs	WWTP Operator (Public Communal Company Water management and Canalisation)
	Quality of recipient	Downstream of effluent discharge point	Visual/sensory inspection, simple routine analyses of recipient samples	Visual inspection: daily/weekly; Laboratory analyses: monthly of twice a month	Prevention of recipient pollution	Included in operational and maintenance costs, plus laboratory analyses costs, approximately 500 KM	WWTP Operator (Public Communal Company Water management and Canalisation)

Start-up and operations	Disposal of waste materials	On site, around site	Visual inspection, disposal record or receipts from landfills	During operation, according to waste management plan	Prevention of environmental pollution, overall plant safety	Included in maintenance costs	WWTP Operator (Public Communal Company Water management and Canalisation)
Start-up and operations	Odour releases from the plant	On site and in immediate surrounding	Sense of smell, complaints by neighbouring population	Daily/upon complaint	Minimization of nuisance of local population	Negligible	WWTP Operator (Public Communal Company Water management and Canalisation), if not satisfied, Environmental Inspection (referent for Environmental protection has to be informed and act in accordance with its obligations in accordance with legal requirements

Start-up and operations	Leaks or spills of fuel, lubricants, coolants and chemicals, such as chlorine	¸On site, around site, along supply routes	Visually, by means of records/routine control, accident report, etc.) or by means of detectors	Daily, during operation, or, as required upon delivery of chemicals, fuels, lubricants and coolants	Prevention of environmental pollution, overall safety	Included in operational/maintenance costs; chlorine leak detector: approximately 1500 KM	WWTP Operator (Public Communal Company Water management and Canalisation),), if not satisfied, Environmental Inspection (referent for Environmental protection has to be informed and act in accordance with its obligations in accordance with legal requirements

Institutional Strengthening

- **Training**

Table 5.3.: Summary of Proposed Training

	Type of training	Training methods	Duration of training	Remarks	Costs /KM	Participant
	Training on environmental monitoring -Training on applicable environmental regulations (focusing on water issues) -Training on environmental monitoring -Technical monitoring on equipment use and maintenance	The training should be organized on site[4]	5 days	Local Consultant 20 man/days literature and handouts	15000	WWTP operator employees
	WWTP Equipment operation - Safe handling, storage and use of chemicals - Maintenance of equipment - Gaining new knowledge on water use and management - Introduction of new equipment and its technology, - Equipment use, safety and efficiency	The training should be organized on site[7]	20 days	Two sessions for maintenance in vegetative and non vegetative period of year	Including in purchasing of WWTP	WWTP operator employees

- **Equipment purchase**

Table 5.4.: Monitoring equipment

[4]The training include theoretical lectures, but to focus on active participation and interaction of the trainees, coupled with specific examples.

Type of equipment	Units	Unit Cost (KM)	Total Cost (KM)	Local or international purchase
Portable Conductivity meter	1	600	600	Local
Portable Dissolved O_2 meter	1	700	700	Local
Portable pH meter	1	500	500	Local
Calibration solution	3	100	300	Local
Digital Photo	1	400	400	Local

5.2.2. Konjic municipal wastewater collection and treatment infrastructure

Description of current situation: The city of Konjic is situated on the banks of river Neretva and is surrounded by the slopes of mountains Bjelašnica and Prenj. Altitude ranges between 270 and 320m. Konjic has a mild continental climate with an average annual temperature of 9.5°C. Jablaničko lake is located northwest from the city. Several brooks and rivers cut through the city, where the most important are rivers Neretva and Trešanica and brooks Tuščica, Orašlje, Radava, Drečelj and Suhi Do, most of which are regulated. Regional road M17 Sarajevo – Mostar runs through Konjic and the railroad as well.

There are around 12,500 people living in the city (data from 2004), 75% of them are connected to the city sewage system, the rest have solved the wastewater problem through the construction of septic tanks those are mainly located on the edge of the city. Analyses predicted that at the end of the planning period the city should have around 20,000 inhabitants.

Before the war, Konjic was a very industrialized town with developed metal and wood processing industries. In the previous projects, industrial wastewaters were also included because of the previous ownership structure (public ownership). There was a common interest of the city and industry to solve this problem. After the war and the privatisation of companies, and because some companies closed down, the problem of wastewater treatment became the responsibility of company owners and they approach this problem independently.

Picture 5.1.: Panorama of city of Konjic

Based on the existing Konjic sewage system project from 1979, a part of the left collector was constructed within the area from Orašje neighbourhood to „Monument - Spomenik". It was approximately 860 meters long, and collected faecal waters from Orašje and Prkanj neighbourhoods and some wastewater from Varda neighbourhood. Temporary discharge to the Neretva river was constructed downstream of "New Bridge" (about 30 meters).

Wastewater treatment project for the city of Konjic and sewage system projects for the city of Konjic from 1970 and 1979 included construction of two collectors (left and right) which were supposed to use three pump stations to convey wastewater to the water treatment plant. The treatment plant is of standard design, and the price of their construction together with the collector construction would amount to 22,000,000.00 KM or approximately 11,260,000.00 €. The plant was to be built in two phases (design documentation is available). The plant was designed to serve 30,000 population equivalent at the end of the planned period (year 2000).

The project included wastewater of the industry of that period, which, at present, works with insignificant capacity compared to the period when the project design was prepared. Major disadvantages of the project are: unfeasibility of collectors construction in phases, high price of construction, high operating costs and costs of maintenance of the device and pump stations, which, having in mind the existing economic situation, could not be financed from the revenue collection from water consumption for a longer period of time. In order to solve a problem, since the city of Konjic is the major polluter in the basin of the Neretva, and largely affects the quality of water of the Neretva and Jablanica Lake, alternative solutions have been sought since 2005 by using bio-filter modules (rotating biological contactor) on main outlets. Due to the terrain configuration, it was concluded that an installation of rotating biological contactor would be very complex both from the technical and construction perspective, and such an option was practically rejected, that is, the option of installing only one such device on the location where it is relatively easy to place such device was selected.

Sewage system of the city of Konjic is constructed as a separate system with the exception of smaller areas of the city where the precipitation waters are integrated into faecal sewage system, which should be reconstructed within the project implementation. The basic concept is based on a construction of two collectors parallel to the flow of the river Neretva, that is, left and right collector.

The main selection criteria for the purpose of analysis were:

- System reliability;
- Implementation costs;
- Maintenance costs;
- Meeting requirements for discharge of treated wastewater

The 1970 and 1974 projects addressing the issue of collection and drainage of the wastewater included several options regarding the collectors. The „Konjic Sewage System Project" from 1970 envisaged construction of two collectors to collect wastewater and direct it to the water treatment plant location. Major drawbacks of this option are too long collectors, that is, high costs of construction and high operating costs.

Description of activity: An urgent intervention project includes investment into improvement of the collector system and additional treatment for reduction of nutrients as follows:

1. Additional construction and reconstruction of parts of the collector system (right collector);
2. Improvement of primary treatment and installation of a smaller device for biological processing for the purposes of reduced nutrient load

Before preparation of Main Project, it is necessary to analyse alternative treatment solutions, especially those concerning constructed wetlands.

Mitigation Plan and Environmental Monitoring Plan

Mitigation Plan and Environmental Monitoring Plan for Konjic Wastewater Treatment System are given in Tables 5.5. and 5.6. below.

Table 5.5: **Mitigation Plan** for Konjic Wastewater Treatment System

Phase	Action	Mitigation Measure	Remarks	Costs	Institutional Responsibility
Construction	Sewage sludge from the improper sewage tank may cause an environmental threat if not disposed of properly	All sewage sludge needs to be collected and disposed of in an environmentally sound manner onto landfill		Approximate transport and disposal costs are 200 KM/tone*km	Cantonal Environmental Inspection (Mrs. Mirsada Gološ) and WWTP operator (Public communal company Water management and canalisation Konjic)
	Construction activities may lead to traffic disruptions and congestions.	Clearly display informative/warning signs around construction area. Limit construction to regular time intervals. Allocate possible alternative traffic routes (diversions). Minimize vegetation clearing for new roads.	New roads for works and WWTP access may be needed.	Included in construction costs	Contractor – to be selected in Public procurement procedure
Construction	Damage of trees and other vegetation during construction activities	Minimize vegetation clearing. Restore and reforest all damaged trees or vegetation after completion of works	Roots of the trees may be severally damaged during construction works, if any digging takes place	Included in construction works	Contractor – to be selected in Public procurement procedure and if needed, environmental supervision
	Temporary interruptions in waste water lines	Providing temporary wastewater pipelines and by pass if needed.		Minor	Contractor - to be selected in Public procurement procedure

Table 5.5: **Mitigation Plan** for Konjic Wastewater Treatment System					
Phase	**Action**	**Mitigation Measure**	**Remarks**	**Costs**	**Institutional Responsibility**
Construction	Construction works may generate temporary higher concentrations of dust.	Reduce dust generated by traffic to the extent possible. If possible, use closed or covered trucks for transportation of construction materials. Sprinkle earth with water to prevent dust generation (especially in dry season), remove excess materials and clean sites upon completion of activities.		Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure and if needed, environment supervision
Construction	Noise and vibration disturbances due to construction works.	Limit construction activities to regular daytime intervals. Establish schedule and/or other specific restrictions on works. If necessary, use noise barriers and/or noise suppressors on equipment.		Minor/Included in construction costs	Contractor and Environment or Civil engineer supervisor – to be selected in the Public procurement procedure

Table 5.5: **Mitigation Plan** for Konjic Wastewater Treatment System

Phase	Action	Mitigation Measure	Remarks	Costs	Institutional Responsibility
Construction	Dug and disposed refuse may cause environmental damage if not taken care in a proper way	Humus and cut trees may be used again. Hazardous waste, if any, must be disposed of in environmentally sound way and in accordance with regulations.		Included in construction works. If hazardous waste will be disposed of, it will be charged as per local prices of Cantonal communal company	Contractor - to be selected in Public procurement procedure
Construction	Fuel, grease and chemicals spillage may cause pollution of underground waters and soil	Control of equipment and vehicles. Isolate and clean the location in case of spillage. Solidification of spilled liquids using adequate material. Store fuels, lubricants, coolants, paint, solvents and bitumen safely and handle them cautiously.		Included in construction works	Contractor - to be selected in Public procurement procedure, WWTP Operator (Public communal company Water management and canalisation Konjic)
Construction	Contractor working camp and working sites	Protection of material erosion specially on Boračko lake site and in vicinity of surface water		Minor	Contractor - to be selected in Public procurement procedure

Table 5.5: **Mitigation Plan** for Konjic Wastewater Treatment System

Phase	Action	Mitigation Measure	Remarks	Costs	Institutional Responsibility
Construction	Although unlikely, chance findings of ordnances, cultural heritage items	Cease all construction works in the area, contact police/civil protection/authorities. Arrange necessary site preservation measures		Minor	Supervision – to be selected in Public procurement procedure and Institute for protection of monuments within Federal Ministry of Culture and Sport

Table 5.5: **Mitigation Plan** for Konjic Wastewater Treatment System

Phase	Action	Mitigation Measure	Remarks	Costs	Institutional Responsibility
Construction	Removed material and/or construction wastes may pose an environmental threat if not disposed of properly, especially if hazardous. Special attention needs to be paid to removed asbestos-cement pipes .	All non-hazardous construction wastes need to be disposed of in an environmentally sound manner. Earth, rock and cut vegetation can be reused or composted, while all non-reusable wastes need to be landfilled at a sanitary landfill. All hazardous wastes need to be handled in accordance with procedures of the Entity Law on Waste Management Prevention of erosion for all materials specially in vicinity of surface water Asbestos, cement pipe remains need to be contained in order to prevent crumbling and generation of air-borne particles, and then disposed.	May be needed WB Environmental supervision. There are no local (BIH or HR) Rules or Laws according asbestos cement pipes or materials	Approximate transport costs are 1 KM/ton *km Disposal costs: 80 KM/ton on sanitary landfill, in accordance with given or more convenient conditions.	Cantonal Environmental Inspector (Ms. Mirsada Gološ) must ensure all regulations and procedures are met.

Table 5.5: **Mitigation Plan** for Konjic Wastewater Treatment System

Phase	Action	Mitigation Measure	Remarks	Costs	Institutional Responsibility
Start up and operation	Incidental discharge of wastewaters not complying with set quality may endanger surroundings	Continuous control of equipment, regular maintenance of equipment, control of discharged wastewater quality. Develop emergency/accident procedures.		Included in wastewater treatment plant costs (maintenance costs)	WWTP Operator (Public communal company Water management and canalisation Konjic) and Municipality of Konjic
	Production of sludge from wastewater treatment process	Proper disposal of sludge. Establish control of sludge content determination		80 KM/t for disposal, plus 1 KM/t for sludge transport	WWTP Operator (Public communal company Water management and canalisation Konjic)
	Odour from the treatment plant	Establish continuous treatment plant process control	Control of VOC and methane concentration may be needed	Included in the plant and maintenance costs	WWTP Operator (Public communal company Water management and canalisation Konjic)
Start-up and operations	Regular discharging of sewage tank	Use adequate car for discharging –sewage tank		Approximate transport costs are 1 KM/tone* km	Cantonal Environmental Inspector (Ms. Mirsada Gološ) and WWTP Operator (Public communal company Water management and canalisation Konjic)

Table 5.5: **Mitigation Plan** for Konjic Wastewater Treatment System					
Phase	**Action**	**Mitigation Measure**	**Remarks**	**Costs**	**Institutional Responsibility**
Start – up and operations	Improper waste disposal may result in environmental pollution	Establish plan and procedures for waste management. Waste disposal to be performed in environmentally sound way. All non-hazardous waste to be disposed of in a proper way. Possible occurrence of hazardous waste to be resolved in accordance with law.		Approximate transport costs are 1 KM/ton *km Disposal costs: 80 KM/ton on sanitary landfill, in accordance with given or more convenient conditions	WWTP Operator (Public communal company Water management and canalisation Konjic)

Table 5.6: Environmental Monitoring Plan for Konjic Wastewater Treatment System

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost	Responsibility
Construction	Quality of recipient water	On the place of discharge	Laboratory analyses (BOD, COD, SM, TKN)	Before any decision on number of small scale facilities and starting of operations	In order to determine load of recipient and evaluate danger to human health and determine level and type of treatment needed	Laboratory analyses: 800 KM	WWTP Operator (Public communal company Water management and canalisation Konjic) and Inspection (Cantonal water inspector in co-operation with environmental inspector)
	Collection and disposal of sewage sludge	On the location	Visually	During removal of existing plant	To prevent pollution of the surrounding environment and possible threats to human health	Included in transport of sludge	Operator (Public communal company Water management and canalisation Konjic) and Supervisor – to be selected in Public procurement procedure

Table 5.6: Environmental Monitoring Plan for Konjic Wastewater Treatment System

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost	Responsibility
Construction	Traffic disruptions and congestions, traffic safety	On site, around site	Visual inspection, complaints from neighbours or traffic participants	Regularly during construction, daily or weekly as appropriate	Prevention of disruptions. Population, traffic participants and workers safety.	Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Site admittance control	On site, around site	Visual inspection	Daily during construction	Population safety	Negligible	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Table 5.6: Environmental Monitoring Plan for Konjic Wastewater Treatment System

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost	Responsibility
Construction	Dust generation	On site, around site	Visual inspection, complaints from neighbours, irritation of respiratory system	Daily, or as required during construction	Minimization of dust dissipation in the area, minimization of irritation of respiratory systems of the population and workers.	Minor/Included in construction works	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Noise and vibration generation	On site, around site	Aural inspection, complaints from neighbours or workers	Daily, or as required during construction	Minimization of population nuisance, protection of workers health	Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Table 5.6: Environmental Monitoring Plan for Konjic Wastewater Treatment System

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost	Responsibility
Construction	Waste generation and management	On site	Visual inspection, disposal records or receipts from landfills	Regular daily control	Protection of soil, groundwater, surface waters, aesthetic reasons.	Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Leaks/spills of fuel, lubricants, coolants, paint, solvents and bitumen	On and around site	Visual inspection. In case of frequent and substantial spills or leaks, detailed lab analysis of the contaminated media and water in the system should be conducted	Visual inspection daily during works. Lab analysis as required.	Protection of environment, workers safety.	Should be included in construction costs; cost of additional laboratory analysis: approximately 800 KM	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Table 5.6: Environmental Monitoring Plan for Konjic Wastewater Treatment System

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost	Responsibility
Construction	Equipment emissions into air	On site, around site	Sensory inspection, air quality meters	Weekly during construction	Population and workers health protection, air quality protection	Portable air emission monitors: approximately 3000 KM	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Cut down damaged trees/vegetation replacement	On site	Visual inspection, photographs prior to start of construction works	Before and after construction works	Natural resources preservation, aesthetic reasons	Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Table 5.6: Environmental Monitoring Plan for Konjic Wastewater Treatment System

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost	Responsibility
Construction	Chance findings of cultural heritage items	On site, around site	Visual inspection	Daily during construction works	Protection of cultural heritage	Negligible	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Table 5.6: Environmental Monitoring Plan for Konjic Wastewater Treatment System

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost	Responsibility
Start up and operations	Quality and quantity of discharged wastewater	On the place of discharge	Laboratory analyses (BOD, COD, SM, TKN) Monitoring with portable water quality equipment	Laboratory analyses periodically. Monitoring with portable water quality equipment to be performed daily, during plant operation	To prevent pollution of recipient	- Minimum 3000 KM per analysis, - once in two years PE calculation - costs according Water management company regulation; - 2500 KM for portable monitoring equipment	Cantonal water inspector and WWTP operator (Public Communal Company Water management and Canalisation) if not satisfied, water inspector has to be informed and act in accordance with its obligations in accordance with legal requirements

Table 5.6: Environmental Monitoring Plan for Konjic Wastewater Treatment System

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost	Responsibility
Start up and operations	Chlorination level	On site, chlorination station/unit	Chlorine dozers, measurement of chlorine, content in treated wastewater	Measurement of chlorine content in treated wastewater in accordance with chlorine dozing regime (continuous or batch-wise)	Protection of recipient flora and fauna	Included in operational costs (chlorination dozer: approximately 400 KM; chlorine-in-water meter: approximately 300 KM	WWTP Operator (Public Communal Company Water management and Canalisation Konjic)
	Disposal/treatment of residual solid products (sludge) from WWTP	On site, around site	Visual inspection, laboratory analyses	Every batch, in accordance with internal sludge management plan	Prevention of environmental pollution	Included in operational costs	WWTP Operator (Public Communal Company Water management and Canalisation Konjic)
	Quality of recipient	Downstream of effluent discharge point	Visual/sensory inspection, simple routine analyses of recipient samples	Visual inspection: daily/weekly; Laboratory analyses: monthly of twice a month	Prevention of recipient pollution	Included in operational and maintenance costs, plus laboratory analyses costs, approximately 500 KM	WWTP Operator (Public Communal Company Water management and Canalisation Konjic)

Table 5.6: Environmental Monitoring Plan for Konjic Wastewater Treatment System

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost	Responsibility
Start-up and operations	Disposal of waste materials	On site, around site	Visual inspection, disposal record or receipts from landfills	During operation, according to waste management plan	Prevention of environmental pollution, overall plant safety	Included in maintenance costs	WWTP Operator (Public Communal Company Water management and Canalisation Konjic)
Start-up and operations	Odour releases from the plant	On site and in immediate surrounding	Sense of smell, complaints by neighbouring population	Daily/upon complaint	Minimization of nuisance of local population	Negligible	WWTP Operator (Public Communal Company Water management and Canalisation), if not satisfied, Environmental Inspector has to be informed and act in accordance with its obligations in accordance with legal requirements

Table 5.6: Environmental Monitoring Plan for Konjic Wastewater Treatment System

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost	Responsibility
Start-up and operations	Leaks or spills of fuel, lubricants, coolants and chemicals, such as chlorine	¸On site, around site, along supply routes	Visually, by means of records/routine control, accident report, etc.) or by means of detectors	Daily, during operation, or, as required upon delivery of chemicals, fuels, lubricants and coolants	Prevention of environmental pollution, overall safety	Included in operational/maintenance costs; chlorine leak detector: approximately 1500 KM	WWTP Operator (Public Communal Company Water management and Canalisation),), if not satisfied, Environmental Inspector has to be informed and act in accordance with its obligations in accordance with legal requirements

Institutional Strengthening

- **Training**

Table 5.7.: Summary of Training Proposed

Type of training	Training methods	Duration of training	Remarks	Costs	Participant
Training on environmental monitoring -Training on applicable environmental regulations (focusing on water issues) -Training on environmental monitoring -Technical monitoring on equipment use and maintenance	The training should be organized on site[5]	5 days	Local Consultant 20 man/days literature and handouts	15000 KM	
WWTP Equipment operators - Safe handling, storage and use of chemicals - Maintenance of equipment - Special training for Wetland operating - Gaining new knowledge on water use and management - Introduction of new equipment and its technology, - Equipment use, safety and efficiency	The training should be organized on site[9]	22 days	Two sessions for maintenance in vegetative and non vegetative period of year	Including in purchasing of WWTP	

[5]The training include theoretical lectures, but to focus on active participation and interaction of the trainees, coupled with specific examples.

- **Equipment purchase**

Table 5.8.: Monitoring equipment

Type of equipment	Units	Unit Cost (KM)	Total Cost (KM)	Local or international purchase
Portable Conductivity meter	1	600	600	Local
Portable Dissolved O_2 meter	1	700	700	Local
Portable pH meter	1	500	500	Local
Calibration solution	3	100	300	Local
Digital Photo	1	400	400	Local

5.2.3. Ljubuški municipal wastewater treatment infrastructure

Description of current situation: The main hydrological and hydro geological characteristics of the Ljubuški area are related to the karst nature of the dinarids terrain and its Adriatic precipitation regime. The soil composition is mostly limestone of Mesozoic and Cenozoic periods, while impermeable rocks appear sporadically. Results of tectonic movements and deep in-ground karstification have created complex subsurface hydro-geological characteristics. In depth clarification of the karst hydro geological and hydrological characteristics can be found in the morphological occurrences, such as karst fields, pits, sink holes, caves and constant or periodical springs. "Ljubuško polje" as a karst field extends along with Tihanljina-Mlade-Trebižat Rivers from Studenci to Ljubuški, Vitina (up to Klobuk) and to the western part of the field up to Grab and Vrgorac (Croatia). Ljubuški municipality is located in the area of 282.7 km^2 with 27,603 inhabitants, which is expressed in population density around 98 inhabitants per km^2. 53% of total land in the municipality is agricultural land, 23% is forestry and only 5% is barren land. Agricultural land covers the surface of 121.5 km^2 out of what 21% is cultivable soil and 22% are meadows and cattle grazing land. More than 2,800 ha of land, consisted of 10 separated areas, have been irrigated by separated irrigation channels.

There is a wastewater treatment plant in the Ljubuški municipality, but not all households in the area are connected to the sewage collection network. For this reason, wastewater is not entirely taken to the plant. Furthermore, the plant consists of only mechanical and biological wastewater treatment. Third phase for nutrient removal has not been implemented yet.

Wastewaters from households that are not connected to the sewage system, but are collected to individual septic tanks, or that include precipitation runoff are directly taken to the karst underground. In same cases, wastewater from households is directly discharged to sink holes, and into the underground.

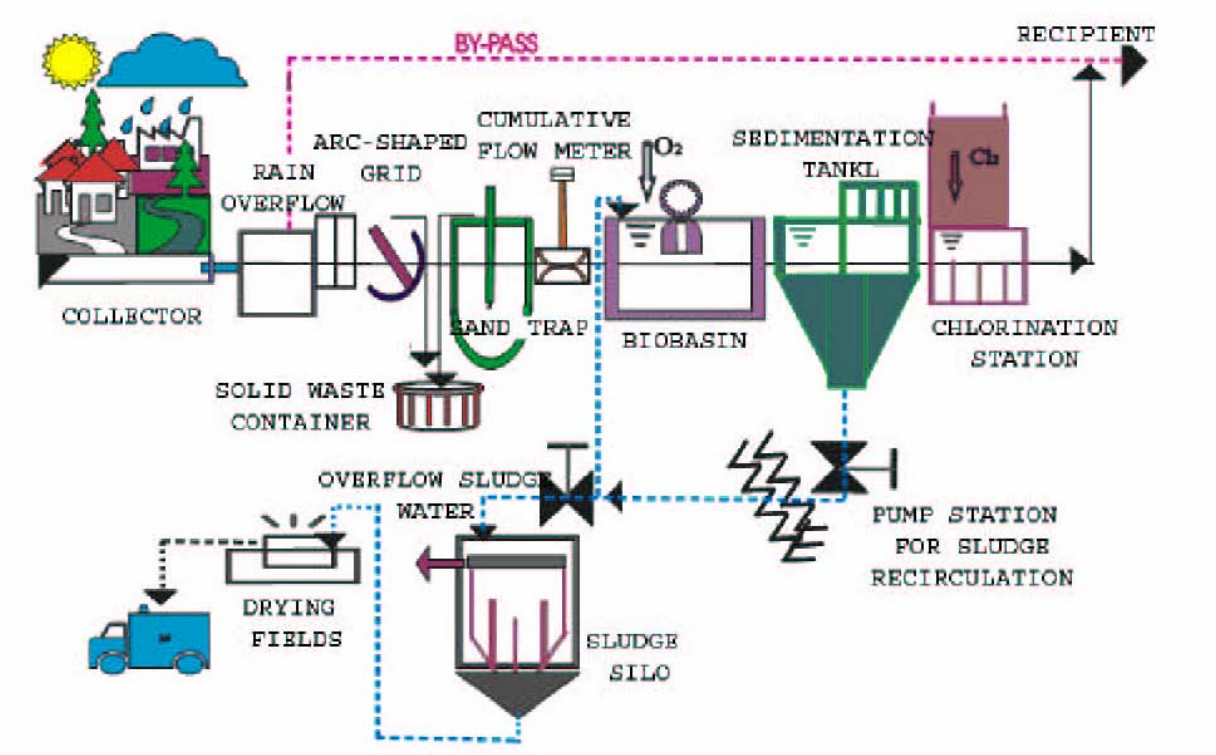
The sewage system in Ljubuški covers 8,705 PE1 (Population Equivalent), and the total industrial wastewater load is 7,500 PE2. Due to agricultural activities (vegetable farms, vineyards, orchards, tobacco growing) in the area of the karst fields near Ljubuški, significant quantity of agricultural chemicals is used. In cases of their inadequate and unplanned use, their toxic ingredients pollute the soil, surface water and groundwater, as well as the air. These chemicals and their packaging should be handled properly. Herbicides and pesticides used are divided in 4 categories in accordance with the World Health Organization (WHO). These categories are based on the hazard level, i.e. toxicity. The WHO recommends using less toxic constituents and handling them properly. Persistent organic pollutants – POPs are another important environmental pollutant category.

Wastewater treatment plant in Ljubuški is located in Matinjevac, some 350 m South-West from the city centre, and around 350 m away from point of release in the recipient. Naturally sloped terrain enables gravitational flow of the water through the plant (reducing the investment and maintenance costs). The plant was built in 1989 as the first phase of the planned construction of the facility.

The construction has been planned in two phases:

Phase I – 5,000 PE, implemented in 1989;
Phase II – 10,000 PE, has not been implemented yet.

The plant has been working continuously since the completion of the Phase I.



Picture 5.2.: Technological scheme of existing wastewater treatment (Phase I)

Rain overflow: Incoming wastewater comes into the plant by gravitation force. Rain overflow regulates quantity of water coming to device.

Automatic arc-shaped gird – Primary mechanical treatment (removal of bigger waste residues of organic and mineral origin). Collected material is stored into a waste tank and transported to the town's landfill.

Sand trap: Separation of bigger mineral additives (sand, gravel, slag, ash, fruit and vegetable waste). Particles collected at the bottom of the sand trap are being pumped by mammoth pump and collected into waste tank to be transported to city landfill.

Cumulative flow meter: Control of hydraulic load, daily reading.

Aeration tank: Biological process of treatment in aerobic conditions is achieved by maintaining micro organisms in suspensions (active sludge). Wastewater runs through microbiological membrane and organic substances are being decomposed on the sludge surface.

Secondary sedimentation tank: Separation of flocculated active sludge, its sedimentation and solidification. Part of the active sludge goes back to bio pool and the rest is being pumped to sludge tanks. Project foresees low organic load (0,05 kg BPK x kg SM x d^{-1}), with

retention time of 20-30 hours. Nitrification takes place in this tank (necessity for oxygen is being reduced and thus, better quality of effluent is accomplished).

Chlorination (disinfections) of effluent: Disinfections is done if needed (epidemics, low flow in recipient etc.) and is foreseen in order to protect the Trebižat River from significant bacteriological pollution.

Sludge tank: Gravitation thickening of aerobically stabilized sludge. Water above the sludge discharges to bio pool and thickened sludge goes to drying fields.

Drying fields: At the open concrete field with sand filling and drainage system, thickened and aerobic stabilized sludge is drying while concentration of dry matter increases up to 40%. There are 4 fields in total, each of 60m^2 surface. Drying process lasts between 10 and 15 days (pending weather conditions). Dehydrated sludge goes for disposal to the landfill or is used as secondary raw material (fertilizer, material for improvement of sand and clay soil).

Description of activity: All the existing structures are planned to be kept during reconstruction. The goal of this specific reconstruction is to increase the capacity of the plant by around 1,000 PE (the long term goal remains 10,000 PE), while ensuring financial sustainability of the plant and respecting the rules of selecting the most appropriate technology; another goal is to improve the clarification level from the current 50-60% to 95%.

Presently some components are operating with reduced capacity or are not being used at all – for instance, the sand trap is not being used, it has been temporarily replaced by barriers at the bottom of the channel from where the sediments are removed manually, using shovels. As a result, this directly affects quality and duration of the biological treatment and secondary sedimentation, and ultimately, the end parameter of elimination of N and P as the main causes of eutrophication.

Reconstruction of the plant would help ensure long-term projected increase in the capacity to 10,000 PE – the sewer network is expected to expand to new neighbourhoods, and include the local vinery.

Mitigation Plan and Environmental Management Plan

Mitigation Plan and Environmental Monitoring Plan for activities to be performed in Ljubuški concerning wastewater treatment are given in Tables 5.9. and 5.10. below.

Table 5.9.: Mitigation Plan for Ljubuški Wastewater Treatment System

Phase	Action	Mitigation measures	Remarks	Cost	Institutional Responsibility
Construction	Damage of trees and other vegetation during construction activities	Minimize vegetation clearing. Prevention of erosion especially on big gravels sites. Restore and reforest all damaged trees or vegetation after completion of works	Roots of the trees may be severally damaged during construction works.	Included in Construction costs	Contractor and Environment or Civil engineer supervisor – both to be selected in Public procurement procedure
Construction	Construction works may generate temporary higher concentrations of dust.	Reduce dust generated by traffic to the extent possible. If possible, use closed or covered trucks for transportation of construction materials. Sprinkle earth with water to prevent dust generation (especially in dry season), remove excess materials and clean sites upon completion of activities.		Minor/Included in construction costs	Contractor and Environment or Civil engineer supervisor – to be selected in the Public procurement procedure

Construction	Noise and vibration disturbances due to construction works	Limit construction activities to regular daytime intervals. Establish schedule and/or other specific restrictions on works. If necessary, use noise barriers and/or noise suppressors on equipment.		Minor/Included in construction costs	Contractor and Environment or Civil engineer supervisor – to be selected in the Public procurement procedure
Construction	Removed material and/or construction wastes may pose an environmental threat if not disposed of properly, especially if hazardous. Special attention needs to be paid to removed asbestos-cement pipes.	All non-hazardous construction wastes need to be disposed of in an environmentally sound manner. Earth, rock and cut vegetation can be reused or composted, while all non-reusable wastes need to be landfilled at a sanitary landfill. All hazardous wastes need to be handled in accordance with procedures of the Entity Law on Waste Management. Prevention of erosion for all materials especially in vicinity of surface water. Asbestos. cement pipe remains need to be contained in order to prevent crumbling and generation of air-borne particles, and then disposed.	WB Environmental supervision may be needed. There are no local (BIH or HR) Rules or Laws according asbestos cement pipes or materials.	Approximate transport costs are 1 KM/ton *km Disposal costs: 80 KM/tone on sanitary landfill, in accordance with given or more convenient conditions.	Cantonal environmental inspector (Ms. Mirsada Gološ) must ensure all regulations and procedures are met.

Construction	Fuel, grease and chemicals spillage may cause pollution of surface water, underground waters and soil	Control of equipment and vehicles. Isolate and clean the location in case of spillage. Solidification of spilled liquids using adequate materials. Store fuels, lubricants, coolants, paint, solvents and bitumen safely and handle them cautiously.		Minor/Included in construction works	Contractor – to be selected in the Public procurement procedure. WWTP Operator (Public Communal Company Water management and Canalisation)
Start up and operation	Incidental discharge of wastewaters not complying with set quality may endanger surroundings	Continuous control of equipment, regular maintenance of equipment, control of discharged wastewater quality. Develop emergency/accident procedures if not developed yet.		Included in wastewater treatment plant costs (maintenance costs)	WWTP Operator (Public communal company "Ljubuški" in Ljubuški)
	Drying fields for sludge drying may cause unpleasant odours spreading	Use covers for drying fields in order to prevent spreading of odour		Up to 2000 KM	WWTP Operator (Public communal company "Ljubuški" in Ljubuški)

Start-up and operations	Use of sludge in agriculture may degrade the soil or pose a risk to human health if done inadequately	Test sludge quality, especially microbiological characteristics. If not satisfactory, prohibit its use in agriculture. If sludge quality is satisfactory and the sludge is used in agriculture,. Check regularly its quality.	Sludge can be used in agriculture after additional treatment	Included in operation al costs, with a possibility of cost sharing with sludge users.	WWTP Operator (Public communal company "Ljubuški" in Ljubuški)
Start up and operation	Odour from the treatment plant	Establish continuous treatment plant process control	Control of methane concentration my be needed	Included in the plant and maintenance costs	WWTP Operator (Public communal company "Ljubuški" in Ljubuški)
	Improper waste disposal may result in environmental pollution	Establish plan and procedures for waste management. Waste disposal to be performed in environmentally sound way. All non-hazardous waste to be disposed of in a proper way. Eventual occurrence of hazardous waste to be resolved in accordance with law.		Estimate: 1KM/t,km, for transport and 80KM/t for disposal	WWTP Operator (Public communal company "Ljubuški" in Ljubuški)

Table 5.10.: Environmental Monitoring Plan for Ljubuški Wastewater Treatment System

Phase	Which parameter is to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility

Construction	Quality of recipient water	On the place of discharge	Laboratory analyses (BPK, HPK, SM, TKN)	Before any decision on number of small scale facilities and starting of operations	In order to determine load of recipient and evaluate danger to human health and determine level and type of treatment needed	800 per analysis	Cantonal water inspector and WWTP Operator
Construction	Dust generation	On site, around site	Visual inspection, complaints from neighbours, irritation of respiratory system	Daily, or as required during construction	Minimization of dust dissipation in the area, minimization of irritation of respiratory systems of the population and workers.	Minor/Included in construction works	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
	Noise and vibration generation	On site, around site	Aural inspection, complaints from neighbours or workers	Daily, or as required during construction	Minimization of population nuisance, protection of workers health	Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Construction	Equipment emissions into air	On site, around site	Sensory inspection, air quality meters	Weekly during construction	Population and workers health protection, air quality protection	Portable air emission monitors: approximately 3000 KM	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
	Cut down damaged trees/vegetation replacement	On site	Visual inspection, photographs prior to start of construction works	Before and after construction works	Natural resources preservation, aesthetic reasons	Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Start up and operations	Quality and quantity of discharged wastewater	On the place of discharge	Laboratory analyses (BOD, COD, SM, TKN) Monitoring with Portable water quality equipment	Laboratory analyses periodically. Monitoring with Portable water quality equipment Daily, during plant operation	To prevent pollution of recipient	Minimum 3000 per analysis once in two years (EBS calculation costs According Water management company regulation); 2500 for portable monitoring equipment	Water inspector and WWTP operator (Public Communal company "Ljubuški")

Start up and operations	Chlorination level	On site, chlorination station/unit	Chlorine dozers, measurement of chlorine, content in treated wastewater	Measurement of chlorine content in treated wastewater in accordance with chlorine dozing regime (continuous or batch-wise)	Protection of recipient flora and fauna	Included in operational costs (chlorination dozer: approximately 400 KM; chlorine-in-water meter: approximately 300 KM	WWTP Operator (Public Communal company "Ljubuški")
	Disposal/treatment of residual solid products (sludge) from WWTP	On site, around site	Visual inspection, laboratory analyses	Every batch, in accordance with internal sludge management plan	Prevention of environmental pollution	Included in operational costs	WWTP Operator (Public Communal company "Ljubuški")
Start up and operations	Quality of recipient	Downstream of effluent discharge point	Visual/sensory inspection, simple routine analyses of recipient samples	Visual inspection: daily/weekly; Laboratory analyses: monthly of twice a month	Prevention of recipient pollution	Included in operational and maintenance costs, plus laboratory analyses costs, approximately 500 KM	WWTP Operator (Public Communal company "Ljubuški"), if not satisfied, water Inspector has to be informed and act in accordance with its obligations in accordance with legal requirements

Start up and operations	Disposal of waste materials	On site, around site	Visual inspection, disposal record or receipts from landfills	During operation, according to waste management plan	Prevention of environmental pollution, overall plant safety	Included in maintenance costs	WWTP Operator (Public Communal company "Ljubuški")
	Odour releases from the plant	On site and in immediate surrounding	Sense of smell, complaints by neighbouring population	Daily/upon complaint	Minimization of nuisance of local population	Negligible	WWTP Operator (Public Communal company "Ljubuški"), if not satisfied, Environmental Inspector has to be informed and act in accordance with its obligations in accordance with legal requirements

Start up and operations	Leaks or spills of fuel, lubricants, coolants and chemicals, such as chlorine	¸On site, around site, along supply routes	Visually, by means of records/routine control, accident report, etc.) or by means of detectors	Daily, during operation, or, as required upon delivery of chemicals, fuels, lubricants and coolants	Prevention of environmental pollution, overall safety	Included in operational/maintenance costs; chlorine leak detector: approximately 1500 KM	WWTP Operator (Public Communal company "Ljubuški"), if not satisfied, Environmental Inspection (referent for Environmental protection has to be informed and act in accordance with its obligations in accordance with legal requirements

Institutional Strengthening

- **Training**

Table 5.11.: Summary of Proposed Training

	Type of training	Training methods	Duration of training	Remarks	Costs / KM	Participant
	Training on environmental monitoring -Training on applicable environmental regulations (focusing on water issues) -Training on environmental monitoring -Technical monitoring on equipment use and maintenance	The training should be organized on site[6]	5 days	Local Consultant 20 man/days literature and handouts	15000	Employees of WWTP operator
	WWTP Equipment operators - Safe handling, storage and use of chemicals - Maintenance of equipment - Gaining new knowledge on water use and management - Introduction of new equipment and its technology, - Equipment use, safety and efficiency	The training should be organized on site[7]	20 days	Two sessions for maintenance in vegetative and non vegetative period of year	Including in purchasing of WWTP	Employees of WWTP operator

[6]The training includes theoretical lectures, but to focus on active participation and interaction of the trainees, coupled with specific examples.

- **Equipment purchase**

Table 5.12.: Monitoring equipment

Type of equipment	Units	Unit Cost (KM)	Total Cost (KM)	Local or international purchase
Portable Conductivity meter	1	600	600	Local
Portable Dissolved O_2 meter	1	700	700	Local
Portable pH meter	1	500	500	Local
Calibration solution	3	100	300	Local
Digital Photo	1	400	400	Local

5.2.4. Nevesinje municipal wastewater collection and treatment infrastructure

Description of current situation: Nevesinje is municipality in RS, population 14.000, discharges its wastewater effluent into the Alagovac reservoir, which is used for the drinking water supply of the town. Insufficient capacity of the collection system has resulted in emergency public health situations when septic tanks have proven inadequate to handle flows. The primary treatment facility needs upgrades to provide improved nutrient removal, as eutrophication of the reservoir is a problem.

Description of activity: Since in Nevesinje, finalization of construction of main collector of fecal sewerage which leads to Ždrijelo (sinking hole) recipient, current priority is to address discharge of rainfall and fecal waste water in the direction Military Barracks – City Stadium and Gas Station – Lapčevine. Existing channels are open type channels, they are not functional and they are undersized, thus wastewater spill over in the surrounding areas is frequent, particularly during rainy period. The problem is even larger having in mind that spill over takes place in the central part of the Town. If this issue is addressed, it would primarily reduce health hazard for population. Also, collector construction and prevention of rainfall spillover would enable use of additional agricultural area, which is very important economic resource. The Project envisages construction of closed type concrete channels, 910 m total length with oval diameter size 135/140 cm, with channel cleaning and control manholes. Cannels would be dug at 2,25 m. Channel longitudinal slope would range from 0,95 – 5,7%. After concrete works, channels would be covered by dug earth at the level of surrounding terrain. Collector construction presents Phase I of Nevesinje waste water management and create preconditions to regulate wastewater treatment, which would present Phase II. Current Neretva and Trebišnjica River Basin Management Project would cover Phase I of this project.

Mitigation Plan and Environmental Management Plan

Mitigation Plan and Environmental Monitoring Plan for activities to be performed in Nevesinje concerning wastewater collection and treatment infrastructure are given in Tables 5.13. and 5.14. below.

Table 5.13.: Mitigation Plan for Nevesinje municipal wastewater collection and treatment infrastructure

Phase	Action	Mitigation measures	Remarks	Cost	Institutional Responsibility
Construction	Construction activities may lead to traffic disruptions and congestions. May be needed new roads for works and WWTP access.	Clearly display informative/warning signs around construction area. Limit construction to regular time intervals. Allocate possible alternative traffic routes (diversions). Minimize vegetation clearing for new roads.	May be needed new roads for works and WWTP access.	Included in construction costs	Contractor – to be selected in Public procurement procedure
Construction	Damage of trees and other vegetation during construction activities	Minimize vegetation clearing. Restore and reforest all damaged trees or vegetation after completion of works	Roots of the trees may be severally damaged during construction works.	Included in Construction Costs	Contractor and Environment or Civil engineer supervisor - to be selected in Public procurement procedure

Table 5.13.: Mitigation Plan for Nevesinje municipal wastewater collection and treatment infrastructure

Phase	Action	Mitigation measures	Remarks	Cost	Institutional Responsibility
Construction	Construction works may generate temporary higher concentrations of dust.	Reduce dust generated by traffic to the extent possible. If possible, use closed or covered trucks for transportation of construction materials. Sprinkle earth with water to prevent dust generation (especially in dry season), remove excess materials and clean sites upon completion of activities.		Minor/Included in construction costs	Contractor and Environment or Civil engineer supervisor – to be selected in the Public procurement procedure
Construction	Noise and vibration disturbances due to construction works	Limit construction activities to regular daytime intervals. Establish schedule and/or other specific restrictions on works. If necessary, use noise barriers and/or noise suppressors on equipment.		Minor/Included in construction costs	Contractor and Environment or Civil engineer supervisor – to be selected in the Public procurement procedure

Table 5.13.: Mitigation Plan for Nevesinje municipal wastewater collection and treatment infrastructure

Phase	Action	Mitigation measures	Remarks	Cost	Institutional Responsibility
Construction	Removed material (if hazardous) may pose an environmental threat if not disposed of properly. Special attention needs to be paid to removed asbestos-cement pipes .	All non-hazardous construction wastes will be used for covering dug channels in which concrete collectors will be placed. Earth, rock and cut vegetation can be reused or composted, while all non-reusable wastes need to be landfilled at a sanitary landfill. All hazardous wastes need to be handled in accordance with procedures of the Entity Law on Waste Management Prevention of erosion for all materials especially in vicinity of surface water. If occurred, asbestos cement pipe remains need to be contained in order to prevent crumbling and generation of air-borne particles, and then disposed.	WB Environmental supervision may be needed. There is no local (BIH or HR) Rules or Laws according asbestos cement pipes or materials	Approximate transport costs are 1 KM/ton *km Disposal costs: 80 KM/ton on sanitary landfill	Municipal environmental inspector (does not exist in this municipality – work to be done by referent for environmental protection in Municipality or by Environmental inspector from Trebinje municipality, Mr. Stevan Bekan since there is currently reform of Inspection taking place in BiH and it is very likely that Mr. Bekan will be in charge of few Municipalities in that region) must ensure all regulations and procedures are met.

Table 5.13.: Mitigation Plan for Nevesinje municipal wastewater collection and treatment infrastructure

Phase	Action	Mitigation measures	Remarks	Cost	Institutional Responsibility
Construction	Fuel, grease and chemicals spillage may cause pollution of surface water, underground waters and soil	Control of equipment and vehicles. Isolate and clean the location in case of spillage. Solidification of spilled liquids using adequate materials.		Included in construction works	Contractor

*Mitigation measures for operation phase will be determined for Phase II of the WWTP construction , which is not the subject of current NTRB Project.

Table 5.14.: Environmental Monitoring Plan for Nevesinje municipal wastewater collection and treatment infrastructure

Phase	Which parameter is to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility

Construction	Dust generation	On site, around site	Visual inspection, complaints from neighbours, irritation of respiratory system	Daily, or as required during construction	Minimization of dust dissipation in the area, minimization of irritation of respiratory systems of the population and workers.	Minor/Included in construction works	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Noise and vibration generation	On site, around site	Aural inspection, complaints from neighbours or workers	Daily, or as required during construction	Minimization of population nuisance, protection of workers health	Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Traffic disruptions and congestions, traffic safety	On site, around site	Visual inspection, complaints from neighbours or traffic participants	Regularly during construction, daily or weekly as appropriate	Prevention of disruptions. Population, traffic participants and workers safety.	Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Construction	Site admittance control	On site, around site	Visual inspection	Daily during construction	Population safety	Negligible	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Waste generation and management	On site	Visual inspection, disposal records or receipts from landfills	Regular daily control	Protection of soil, groundwater, surface waters, aesthetic reasons.	Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Leaks/spills of fuel, lubricants, coolants, paint, solvents and bitumen	On and around site	Visual inspection. In case of frequent and substantial spills or leaks, detailed lab analysis of the contaminated media and water in the system should be conducted	Visual inspection daily during works. Lab analysis as required.	Protection of environment, workers safety.	Should be included in construction costs; cost of additional lab testing: approximately 800 KM	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Construction	Equipment emissions into air	On site, around site	Sensory inspection, air quality meters	Weekly during construction	Population and workers health protection, air quality protection	Portable air emission monitors: approximately 3000 KM	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Cut down damaged trees/vegetation replacement	On site	Visual inspection, photographs prior to start of construction works	Before and after construction works	Natural resources preservation, aesthetic reasons	Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

*Environmental monitoring plan for operation phase will be determined for Phase II of the WWTP construction , which is not the subject of current NTRB Project.

Institutional Strengthening

- **Training**

Table 5.15.:Summary of Proposed Training

	Type of training	Training methods	Duration of training	Remarks	Costs / KM	Participant
	Training on environmental monitoring -Training on applicable environmental regulations (focusing on water issues) -Training on environmental monitoring -Technical monitoring on equipment use and maintenance	The training should be organized on site[7]	5 days	Local Consultant 20 man/days literature and handouts	15000	Employees of WWTP operator
	WWTP Equipment operators - Safe handling, storage and use of chemicals - Maintenance of equipment - Gaining new knowledge on water use and management - Introduction of new equipment and its technology, - Equipment use, safety and efficiency	The training should be organized on site[7]	20 days	Two sessions for maintenance in vegetative and non vegetative period of year	Including in purchasing of WWTP	Employees of WWTP operator

*Training will be performed when WWTP and its operation will be close to being established.

[7]The training include theoretical lectures, but to focus on active participation and interaction of the trainees, coupled with specific examples.

- **Equipment purchase**

Table 5.16.: Monitoring equipment

Type of equipment	Units	Unit Cost (KM)	Total Cost (KM)	Local or international purchase
Portable Conductivity meter	1	600	600	Local
Portable Dissolved O_2 meter	1	700	700	Local
Portable pH meter	1	500	500	Local
Calibration solution	3	100	300	Local
Digital Photo	1	400	400	Local

5.2.5. Trebinje Municipal Wastewater Collection and Treatment Infrastructure

Description of current situation: Trebinje is a town in RS and has a population of about 32.000. Only 60% of the city is covered by sewerage and this has resulted in significant pollution of the Trebisnjica River into which it directly discharges. There is a primary wastewater treatment, insufficient by quality and quantity.

Description of activity: The project would finance extension of the collection system and upgrades to the wastewater treatment plant to provide secondary treatment and nutrient removal. Project objective is construction of faecal sewerage in Police community, Jovana Cvijića Street, and its connection to existing municipal sewerage networks, a well as waste water transport to waste water treatment plant, which has been functioning over twenty years. This would enable to eliminate in the community septic tanks, large number of which spills over on the surface. Current activities related to Neretva and Trebišnjica River Basin Management Project, and Neretva and Trebišnjica River Basin Water and Land Resources Assessment, particularly, assessed communal wastewater treatment issue as the one, which should be addressed as priority. Current faecal wastewater collection methods from households present significant environmental threat. Majority of households is not connected to sewerage networks, but they use individual septic tanks to collect their wastewater. Such septic tanks have not been constructed as sanitary ones, but they are water permeable and they pollute ground water. Addressing this problem would prevent further ground water pollution, particularly having in mind that it is extremely karst area. Around 400 people live in this area. Implementation period will be conducted in two phases, as follows:

Phase I: Main desing development, obtaining necessary permits, construction permit, carrying out procurement procedure – around 150 days.

Phase II: Construction works on main street fecal collector and accompaning secondary civil works – 60 days

Mitigation Plan and Environmental Management Plan

Mitigation Plan and Environmental Monitoring Plan for activities to be performed in Trebinje concerning wastewater collection and treatment infrastructure are given in Tables 5.17. and 5.18. below.

According to the information obtained by designer and Municipality, only construction works will be done within NTRB project, thus mitigation measures and environmental monitoring plan are given only for this phase.

Table 5.17.: Mitigation Plan for Trebinje municipal wastewater collection and treatment infrastructure

Phase	Action	Mitigation measures	Remarks	Cost	Institutional Responsibility
Construction	Construction activities may affect traffic safety.	Clearly display informative/warning signs around construction area. Limit construction works to regular time intervals. Allocate possible alternative traffic routes (diversions).		Included in construction costs	Contractor – to be selected in the Public procurement procedure
Construction	Construction activities may lead to traffic disruptions and congestions.	Clearly display informative/warning signs around construction area. Limit construction works to regular time intervals. Allocate possible alternative traffic routes (diversions). Minimize vegetation clearing for new roads.	Part of sub component activates may be in urban area and part in the rural area. New roads for works and WWTP access may be needed.	Included in construction costs	Contractor – to be selected in the Public procurement procedure

Table 5.17.: Mitigation Plan for Trebinje municipal wastewater collection and treatment infrastructure

Phase	Action	Mitigation measures	Remarks	Cost	Institutional Responsibility
Construction	Damage of trees and other vegetation during construction activities	Minimize vegetation clearing. Prevention of erosion, especially on big gravels sites. Restore and reforest all damaged trees or vegetation after completion of works.	Roots of the trees may be severally damaged during construction works.	Included in construction costs	Contractor and Environment or Civil engineer supervisor - to be selected in the Public procurement procedure
Construction	Fuel, grease and chemicals spillage may cause pollution of surface water, underground waters and soil	Control of equipment and vehicles. Isolate and clean the location in case of spillage. Solidification of spilled liquids using adequate materials. Store flues, lubricants, coolants and chemicals safely and handle them cautiously.		Included in construction works	Contractor – to be selected in the Public procurement procedure

Table 5.17.: Mitigation Plan for Trebinje municipal wastewater collection and treatment infrastructure

Phase	Action	Mitigation measures	Remarks	Cost	Institutional Responsibility
Construction	Construction works may generate temporary higher concentrations of dust.	Reduce dust generated by traffic to the extent possible. If possible, use closed or covered trucks for transportation of construction materials. Sprinkle earth with water to prevent dust generation (especially in dry season), remove excess materials and clean sites upon completion of activities.		Minor/Included in construction costs	Contractor and Environment or Civil engineer supervisor – to be selected in the Public procurement procedure
Construction	Noise and vibration disturbances due to construction works	Limit construction activities to regular daytime intervals. Establish schedule and/or other specific restrictions on works. If necessary, use noise barriers and/or noise suppressors on equipment.		Minor/Included in construction costs	Contractor and Environment or Civil engineer supervisor – to be selected in the Public procurement procedure

Table 5.17.: Mitigation Plan for Trebinje municipal wastewater collection and treatment infrastructure

Phase	Action	Mitigation measures	Remarks	Cost	Institutional Responsibility
Construction	Removed material and/or construction wastes may pose an environmental threat if not disposed of properly, especially if hazardous. Special attention needs to be paid to removed asbestos-cement pipes .	All non-hazardous construction wastes need to be disposed of in an environmentally sound manner. Earth, rock and cut vegetation can be reused or composted, while all non-reusable wastes need to be landfilled at a sanitary landfill. All hazardous wastes need to be handled in accordance with procedures of the Entity Law on Waste Management Prevention of erosion for all materials specially in vicinity of surface water Asbestos, cement pipe remains need to be contained in order to prevent crumbling and generation of air-borne particles, and then disposed.	WB Environmental supervision may be needed. There is no local (BIH or HR) Rules or Laws according asbestos or cement pipes or materials.	Approximate transport costs are 1 KM/ton *km Disposal costs: 80 KM/ton on sanitary landfill, in accordance with given or more convenient conditions.	Municipal environmental inspector - Mr. Stevan Bekan must ensure all regulations and procedures are met.

Table 5.18.: Environmental Monitoring Plan for Trebinje municipal wastewater collection and treatment infrastructure

Phase	Which parameter is to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility

Construction	Quality of recipient water	On the place of discharge	Laboratory analyses (BOD, COD, SM, TKN)	Before any decision on number of small scale facilities and starting of operations	In order to determine load of recipient and evaluate danger to human health and determine level and type of treatment needed	800 per analysis	Water inspector of Trebinje Municipality
Construction	Traffic disruptions and congestions, traffic safety	On site, around site	Visual inspection, complaints from neighbours or traffic participants	Regularly during construction, daily or weekly as appropriate	Prevention of disruptions. Population, traffic participants and workers safety.	Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
	Site admittance control	On site, around site	Visual inspection	Daily during construction	Population safety	Negligible	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Construction	Dust generation	On site, around site	Visual inspection, complaints from neighbours, irritation of respiratory system	Daily, or as required during construction	Minimization of dust dissipation in the area, minimization of irritation of respiratory systems of the population and workers.	Minor/Included in construction works	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
	Noise and vibration generation	On site, around site	Aural inspection, complaints from neighbours or workers	Daily, or as required during construction	Minimization of population nuisance, protection of workers health	Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Waste generation and management	On site	Visual inspection, disposal records or receipts from landfills	Regular daily control	Protection of soil, groundwater, surface waters, aesthetic reasons.	Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Construction	Leaks/spills of fuel, lubricants, coolants, paint, solvents and bitumen	On and around site	Visual inspection. In case of frequent and substantial spills or leaks, detailed lab analysis of the contaminated media and water in the system should be conducted	Visual inspection daily during works. Lab analysis as required.	Protection of environment, workers safety.	Should be included in construction costs; cost of additional lab testing: approximately 800 KM	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Equipment emissions into air	On site, around site	Sensory inspection, air quality meters	Weekly during construction	Population and workers health protection, air quality protection	Portable air emission monitors: approximately 3000 KM	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure
Construction	Cut down damaged trees/vegetation replacement	On site	Visual inspection, photographs prior to start of construction works	Before and after construction works	Natural resources preservation, aesthetic reasons	Minor/Included in construction costs	Contractor – to be selected in Public procurement procedure. Supervision (Construction and Environmental) – to be selected in Public procurement procedure

Institutional Strengthening

- **Training**

Table 5.19..:Summary of Proposed Training

	Type of training	Training methods	Duration of training	Remarks	Costs / KM	Participant
	Training on environmental monitoring -Training on applicable environmental regulations (focusing on water issues) -Training on environmental monitoring -Technical monitoring on equipment use and maintenance	The training should be organized on site[8]	5 days	Local Consultant 20 man/days literature and handouts	15000	Employees of WWTP operator
	WWTP Equipment operators - Safe handling, storage and use of chemicals - Maintenance of equipment - Gaining new knowledge on water use and management - Introduction of new equipment and its technology, - Equipment use, safety and efficiency	The training should be organized on site[7]	20 days	Two sessions for maintenance in vegetative and non vegetative period of year	Including in purchasing of WWTP	Employees of WWTP operator

[8]The training include theoretical lectures, but to focus on active participation and interaction of the trainees, coupled with specific examples.

- **Equipment purchase**

Table 5.20.: Monitoring equipment

Type of equipment	Units	Unit Cost (KM)	Total Cost (KM)	Local or international purchase
Portable Conductivity meter	1	600	600	Local
Portable Dissolved O_2 meter	1	700	700	Local
Portable pH meter	1	500	500	Local
Calibration solution	3	100	300	Local
Digital Photo	1	400	400	Local

5.2.6. Industrial Pollution Control

5.2.6.1. Upgrade to wastewater treatment system at the "SurTecEurosjaj" metallurgy company in Konjic

Description of current situation: Company SUR-Eurosjaj deals with galvanization, among other business activities, and provides following services:

- zinc plating of steel in low acid zinc baths;
- passivation of zinc plated objects (yellow, blue and green);
- hard chroming;
- decorative protection Cu – Ni – Cr;
- cyanide copper plating.

In all of the listed processes metal salts of Zinc, Copper, Chrome and Nickel are used, as well as various alkaline degreasers, detergents (additives), acids (HCl, HNO_3) for activation. A consequence of using those chemicals is production of wastewaters that contain Cr6+, Cr3+, Cu2+, Ni2+, Fe2+, Fe3+, anions Cl-, NO3-, SO42-, CN- and others. Additives are also used in flattening and polishing, and catalysts are used in passivation and degreasing. Keeping in mind the stated facts, in this conceptual solution 95–98 % of rinse waters will re-circulate inside the facility, while only 2–5 % will appear as pollution carrying concentrates, which will be subjected to chemical and physical treatment aimed at removing harmful substances.

The current solution for wastewater treatment is not capable of removing heavy metals even close to the regulative requirements. Wastewaters are collected in tanks where neutralization is carried out.

Description of activity: Conceptual solution for wastewater treatment is based on:

- Re-circulation of rinse waters in a closed loop, tank – collector – metal removal device (filled with an ion exchange resin) – tank.
- Accumulation of concentrates in collectors based on water quality, Chrome water, Copper, Nickel, Zinc, Acidic waters, Alkaline waters
- Concentrate processing according to the prescribed technology in two batch processes for Chrome, Cyanides and other metals up to 0,1 mg/l
- Separation of heavy metal sludge on a filter press
- Selective ion processing where the leftover heavy metals (concentrations below 0,1 mg/l) are collected on a special ion exchange resin
- Neutralization of wastewaters to a pH level of 6,0 – 9,0, or if desired to a narrower range, by an automated device that logs pH values of water being discharged into the recipient.

Mitigation Plan and Environmental Management Plan

Mitigation Plan and Environmental Monitoring Plan for Upgrade to wastewater treatment system at the "SurTecEurosjaj" metallurgy company in Konjic are given in Tables 5.21. and 5.22. below.

Table 5.21.: Mitigation Plan for Upgrade to wastewater treatment system at the "SurTecEurosjaj" metallurgy company in Konjic					
Phase	**Action**	**Mitigation Measure**	**Remarks**	**Costs**	**Institutional Responsibility**
Rehabilitation/Reconstruction	Sewage from the improper sewage tank may cause an environmental threat if not disposed of properly	All sewage sludge needs to be collected and disposed of in an environmentally sound manner onto landfill		Approximate transport and disposed of costs are 200 KM/tone[6]	Cantonal Environmental Inspection (Mrs. Mirsada Gološ) and WWTP operator (Public communal company Water management and canalisation Konjic)
	Temporary dislocation of wastewaters flow	Assure proper collection of wastewaters in order to release them after rehabilitation works into recipient in environmentally sound manner	It may be needed to purchase additional container for temporary storage of wastewaters	Approximately 5000 KM for wastewaters container plus additional equipment for container discharging amounting approximately 3000 KM	Cantonal Environmental Inspection (Mrs. Mirsada Gološ) and WWTP operator – SurTecEurosjaj
Rehabilitation/Reconstruction	Fuel, grease and chemicals spillage may cause pollution of underground waters and soil	Control of equipment and vehicles. Isolate and clean the location in case of spillage. Solidification of spilled liquids using adequate material. Store fuels, lubricants, coolants, chemicals safely and handle them safely.		Included in construction works	Contractor – to be selected in Public procurement procedure and WWTP operator – SurTecEurosjaj

Table 5.21.: Mitigation Plan for Upgrade to wastewater treatment system at the "SurTecEurosjaj" metallurgy company in Konjic

Phase	Action	Mitigation Measure	Remarks	Costs	Institutional Responsibility
Start up and operation	Incidental discharge of wastewaters not complying with set quality may endanger surroundings	Continuous control of equipment, regular maintenance of equipment, control of discharged wastewater quality		Included in wastewater treatment plant costs (maintenance costs)	WWTP Operator – SurTecEurosjaj
	Production of sludge from wastewater treatment process	Proper disposal of sludge. Establish control of sludge content determination		80 KM/t for disposal, plus 1 KM/t for sludge transport	WWTP Operator – SurTecEurosjaj
	Higher concentrations of heavy metals in effluent may endanger human health and flora and fauna of the recipient	Assure proper laboratory analyses are performed regularly at the discharge point. Keep plant operation regular and control it.		Additional laboratory analyses for determination of heavy metals: 60 KM per metal determined.	WWTP Operator – SurTecEurosjaj
Start up and operation	Odour from the treatment plant	Establish continuous treatment plant process control	Control of VOC and methane concentration my be needed	Included in the plant and maintenance costs	WWTP Operator – SurTecEurosjaj
	Regular discharging of sewage tank	Use adequate car for discharging –sewage tank		Approximate transport costs are 1 KM/tone, km	WWTP Operator – SurTecEurosjaj

Table 5.21.: Mitigation Plan for Upgrade to wastewater treatment system at the "SurTecEurosjaj" metallurgy company in Konjic					
Phase	**Action**	**Mitigation Measure**	**Remarks**	**Costs**	**Institutional Responsibility**
Start up and operation	Improper waste disposed may result in environmental pollution	Establish plan and procedures for waste management. Waste disposal to be performed in environmentally sound way. All non-hazardous waste to be disposed of in a proper way. Possible occurrence of hazardous waste to be resolved in accordance with law.		Approximate transport costs are 1 KM/ton *km Disposal costs: 80 KM/ton on sanitary landfill	WWTP Operator – SurTecEurosjaj

Table 5.22.: Environmental Monitoring Plan for Upgrade to wastewater treatment system at the "SurTecEurosjaj" metallurgy company in Konjic

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Rehabilitation/Reconstruction	Collection and disposal of sewage sludge	On the location	Visually	During rehabilitation works	To prevent pollution of the surrounding environment and possible threats to human health	Included in transport of sludge	WWTP Operator – SurTecEurosjaj and Supervisor(to be selected in public procurement procedure)
	Fuel, grease and chemicals spillage	Below and around material storage	Visually in order to determine spillage, in case of major spillage it is necessary to make analysis of media at the location.	Daily, during construction works and if needed in laboratory	Ground and surface waters protection	Included in rehabilitation costs and additional 1000-1500 for laboratory tests	Contractor – to be selected in Public procurement procedure
Set up and exploitation	Production of sludge from wastewater treatment process	On the location of the plant for collection of treated sludge	Moisture, quantity and content of sludge	Weekly, during plants operation	Environmental protection and protection of employees on the plant	Included in costs of operations	WWTP Operator – SurTecEurosjaj

Table 5.22.: Environmental Monitoring Plan for Upgrade to wastewater treatment system at the "SurTecEurosjaj" metallurgy company in Konjic

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Set up and exploitation	Concentrations of heavy metals in effluent	On the discharge point	Laboratory analyses	Periodically	To prevent recipient pollution, treats to human health and protect flora and fauna of the recipient	60 KM per metal determined	Cantonal water inspector and WWTP operator – SurTecEurosjaj. If not satisfied, water inspector has to be informed and act in accordance with its obligations in accordance with legal requirements

Table 5.22.: Environmental Monitoring Plan for Upgrade to wastewater treatment system at the "SurTecEurosjaj" metallurgy company in Konjic

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Set up and exploitation	Improper work of the plant. Incidental discharge of untreated wastewater	On the location of the plant	Visually, compliance control	Daily during plant operation	Protection of recipient waters	Included in plant operation costs. Eventually needed additional analyzes out of plant laboratory: 800 per analysis (BPK, HPK, SM, TKN)	WWTP Operator – SurTecEurosjaj

Table 5.22.: Environmental Monitoring Plan for Upgrade to wastewater treatment system at the "SurTecEurosjaj" metallurgy company in Konjic

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Set up and exploitation	Quality and quantity of discharged wastewater	On the place of discharge	Laboratory analyses (BOD, COD, SM, TKN) Monitoring with Portable water quality equipment	Laboratory analyses periodically. Monitoring with Portable water quality equipment Daily, during plant operation	To prevent pollution of recipient	Minimum 3000 per analysis once in two years (PE calculation costs According Water management company regulation); 2500 KM for portable monitoring equipment	Cantonal water inspector and WWTP operator – SurTecEurosjaj. If not satisfied, water inspector has to be informed and act in accordance with its obligations in accordance with legal requirements

Table 5.22.: Environmental Monitoring Plan for Upgrade to wastewater treatment system at the "SurTecEurosjaj" metallurgy company in Konjic

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Set up and exploitation	Chlorination level	On site, chlorination station/unit	Chlorine dozers, measurement of chlorine, content in treated wastewater	Measurement of chlorine content in treated wastewater in accordance with chlorine dozing regime (continuous or batch-wise)	Protection of recipient flora and fauna	Included in operational costs (chlorination dozer: approximately 400 KM; chlorine-in-water meter: approximately 300 KM	WWTP Operator – SurTecEurosjaj
Set up and exploitation	Disposal/treatment of residual solid products (sludge) from WWTP	On site, around site	Visual inspection, laboratory analyses	Every batch, in accordance with internal sludge management plan	Prevention of environmental pollution	Included in operational costs	WWTP Operator – SurTecEurosjaj

Table 5.22.: Environmental Monitoring Plan for Upgrade to wastewater treatment system at the "SurTecEurosjaj" metallurgy company in Konjic

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Set up and exploitation	Quality of recipient	Downstream of effluent discharge point	Visual/sensory inspection, simple routine analyses of recipient samples	Visual inspection: daily/weekly; Laboratory analyses: monthly of twice a month	Prevention of recipient pollution	Included in operational and maintenance costs, plus laboratory analyses costs, approximately 500 KM	WWTP Operator – SurTecEurosjaj, if not satisfied, Cantonal water inspector has to be informed and act in accordance with its obligations and legal requirements

Institutional Strengthening

- **Training**

Table 5.23.: Summary of Training Proposed

Type of training	Training methods	Duration of training	Remarks	Costs/KM	Participant
Training on environmental monitoring -Training on applicable environmental regulations (focusing on water issues) -Training on environmental monitoring -Technical monitoring on equipment use and maintenance	The training should be organized on site[9]	5 days	Local Consultant 20 man/days literature and handouts	15000	Metallurgy company management
WWTP Equipment operators - Safe handling, storage and use of chemicals - Maintenance of equipment - Special training for Wetland operating - Gaining new knowledge on water use and management - Introduction of new equipment and its technology, - Equipment use, safety and efficiency	The training should be organized on site[9]	22 days	Two sessions for maintenance in vegetative and non vegetative period of year	Including in purchasing of WWTP	Metallurgy company management

[9]The training includes theoretical lectures, but to focus on active participation and interaction of the trainees, coupled with specific examples.

- **Equipment purchase**

Table 5.24.: Monitoring equipment

Type of equipment	Units	Unit Cost (KM)	Total Cost (KM)	Local or international purchase
Portable Conductivity meter	1	600	600	Local
Portable Dissolved O_2 meter	1	700	700	Local
Portable pH meter	1	500	500	Local
Calibration solution	3	100	300	Local
Digital Photo	1	400	400	Local

5.2.6.2 Upgrade to wastewater treatment system at the "UNISGAL" metallurgy company in Konjic

Description of current situation: The company UNISGAL was established in 1978 as a part of a larger company UNIS –TADIV Konjic for galvanic protection of its products. It was a part of the company TADIV until 1989 when it was transformed into an autonomous company UNISGAL with an expanded scope of activities.

Together with its German partner, management of UNISGAL has developed a program for production of salts and additives for galvanization and had conquered the market of the former state. This is certainly the best business period for the company UNISGAL Konjic.

In 2001 the ownership structure changes and UNISGAL transforms into a holding company (owned by shareholders) UNISGAL d.d. Konjic. From 1996 the production program of UNISGAL is based on galvanic protection of metals, most of which are zinc, copper, nickel and chrome plating, phosphating, black finishing and other types of protection which represent a smaller part of the entire production volume.

Description of activity: During 2002, UNISGAL in cooperation with ECOLINKS and REASCOM developed a study for the wastewater treatment system. The study is based on a re-circulation water system and on the usage of certain substances, which are physically and chemically extracted from the wastewater.

The study was done based on real parameters, which were collected using modern measuring techniques during the whole year. In the study, two phases of the wastewater system implementation are planned. Such a system enables, through addition of certain electrolytes and certain equipment components, an increase in production volumes that is certainly better than the ion exchangers, which are sized for a specific water flow rate.

The two phases of implementation are:

PHASE I
To reduce the costs of the wastewater treatment equipment it is necessary first to reduce the water flow rate and with it the concentration of ions present after rinsing. This phase presumes that water is separated based on chemical contents and discharged into separate accumulation tanks.

PHASE II
In this phase a number of construction activities on existing accumulation tanks are planned, as well as acquisition and installation of equipment necessary for the physical – chemical treatment of wastewaters and recycling according to methods elaborated in the study. Separate pipes to accumulation tanks would convey acidic and alkaline rinse waters that do not contain metals (waters from the material preparation phase). From these tanks, rinse water would be piped through filters with active coal to the final tank and following the controlled adjustment of pH values, would be returned into the rinsing process.

Mitigation Plan and Environmental Management Plan

Mitigation Plan and Environmental Monitoring Plan for Upgrade to wastewater treatment system at the "UNISGAL" metallurgy company in Konjic are given in Tables 5.25. and 5.26. below.

Table 5.25.: Mitigation Plan for Upgrade to wastewater treatment system at the "UNISGAL" metallurgy company in Konjic					
Phase	**Action**	**Mitigation Measure**	**Remarks**	**Costs**	**Institutional Responsibility**
Rehabilitation/Reconstruction	Sewage from the improper sewage tank may cause an environmental threat if not disposed of properly	All sewage sludge needs to be collected and disposed of in an environmentally sound manner onto landfill		Approximate transport and disposed of costs are 200 KM/tone[6]	Cantonal Environmental Inspection (Mrs. Mirsada Gološ) and WWTP operator (Public communal company Water management and canalisation Konjic)
	Temporary dislocation of wastewaters flow	Assure proper collection of wastewaters in order to release them after rehabilitation works into recipient in environmentally sound manner	It may be needed to purchase additional container for temporary storage of wastewaters	Approximately 5000 KM for wastewaters container plus additional equipment for container discharging amounting approximately 3000 KM	Cantonal Environmental Inspection (Mrs. Mirsada Gološ) and WWTP operator – UNISGAL
Rehabilitation/Reconstruction	Fuel, grease and chemicals spillage may cause pollution of underground waters and soil	Control of equipment and vehicles. Isolate and clean the location in case of spillage. Solidification of spilled liquids using adequate material. Store fuels, lubricants, coolants, chemicals safely and handle them safely.		Included in construction works	Contractor – to be selected in Public procurement procedure and WWTP operator – UNISGAL

Table 5.25.: Mitigation Plan for Upgrade to wastewater treatment system at the "UNISGAL" metallurgy company in Konjic

Phase	Action	Mitigation Measure	Remarks	Costs	Institutional Responsibility
Start up and operation	Incidental discharge of wastewaters not complying with set quality may endanger surroundings	Continuous control of equipment, regular maintenance of equipment, control of discharged wastewater quality		Included in wastewater treatment plant costs (maintenance costs)	WWTP Operator – UNISGAL
	Production of sludge from wastewater treatment process	Proper disposal of sludge. Establish control of sludge content determination		80 KM/t for disposal, plus 1 KM/t for sludge transport	WWTP Operator – UNISGAL
	Higher concentrations of heavy metals in effluent may endanger human health and flora and fauna of the recipient	Assure proper laboratory analyses are performed regularly at the discharge point. Keep plant operation regular and control it.		Additional laboratory analyses for determination of heavy metals: 60 KM per metal determined.	WWTP Operator – UNISGAL
Start up and operation	Odour from the treatment plant	Establish continuous treatment plant process control	Control of VOC and methane concentration my be needed	Included in the plant and maintenance costs	WWTP Operator – UNISGAL
	Regular discharging of sewage tank	Use adequate car for discharging –sewage tank		Approximate transport costs are 1 KM/tone, km	WWTP Operator – UNISGAL

Table 5.25.: Mitigation Plan for Upgrade to wastewater treatment system at the "UNISGAL" metallurgy company in Konjic					
Phase	**Action**	**Mitigation Measure**	**Remarks**	**Costs**	**Institutional Responsibility**
Start up and operation	Improper waste disposed may result in environmental pollution	Establish plan and procedures for waste management. Waste disposal to be performed in environmentally sound way. All non-hazardous waste to be disposed of in a proper way. Possible occurrence of hazardous waste to be resolved in accordance with law.		Approximate transport costs are 1 KM/ton *km Disposal costs: 80 KM/ton on sanitary landfill	WWTP Operator – UNISGAL

Table 5.26.: Environmental Monitoring Plan for Upgrade to wastewater treatment system at the "UNISGAL" metallurgy company in Konjic

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Rehabilitation/Reconstruction	Collection and disposal of sewage sludge	On the location	Visually	During rehabilitation works	To prevent pollution of the surrounding environment and possible threats to human health	Included in transport of sludge	WWTP Operator – UNISGAL and Supervisor(to be selected in public procurement procedure)
	Fuel, grease and chemicals spillage	Below and around material storage	Visually in order to determine spillage, in case of major spillage it is necessary to make analysis of media at the location.	Daily, during construction works and if needed in laboratory	Ground and surface waters protection	Included in rehabilitation costs and additional 1000-1500 for laboratory tests	Contractor – to be selected in Public procurement procedure
Set up and exploitation	Production of sludge from wastewater treatment process	On the location of the plant for collection of treated sludge	Moisture, quantity and content of sludge	Weekly, during plants operation	Environmental protection and protection of employees on the plant	Included in costs of operations	WWTP Operator – UNISGAL

Table 5.26.: Environmental Monitoring Plan for Upgrade to wastewater treatment system at the "UNISGAL" metallurgy company in Konjic

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Set up and exploitation	Concentrations of heavy metals in effluent	On the discharge point	Laboratory analyses	Periodically	To prevent recipient pollution, treats to human health and protect flora and fauna of the recipient	60 KM per metal determined	Cantonal water inspector and WWTP operator – UNISGAL. If not satisfied, water inspector has to be informed and act in accordance with its obligations in accordance with legal requirements

Table 5.26.: Environmental Monitoring Plan for Upgrade to wastewater treatment system at the "UNISGAL" metallurgy company in Konjic

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Set up and exploitation	Improper work of the plant. Incidental discharge of untreated wastewater	On the location of the plant	Visually, compliance control	Daily during plant operation	Protection of recipient waters	Included in plant operation costs. Eventually needed additional analyzes out of plant laboratory: 800 per analysis (BPK, HPK, SM, TKN)	WWTP Operator – UNISGAL

Table 5.26.: Environmental Monitoring Plan for Upgrade to wastewater treatment system at the "UNISGAL" metallurgy company in Konjic

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Set up and exploitation	Quality and quantity of discharged wastewater	On the place of discharge	Laboratory analyses (BOD, COD, SM, TKN) Monitoring with Portable water quality equipment	Laboratory analyses periodically. Monitoring with Portable water quality equipment Daily, during plant operation	To prevent pollution of recipient	Minimum 3000 per analysis once in two years (PE calculation costs According Water management company regulation); 2500 KM for portable monitoring equipment	Cantonal water inspector and WWTP operator – UNISGAL. If not satisfied, water inspector has to be informed and act in accordance with its obligations in accordance with legal requirements

Table 5.26.: Environmental Monitoring Plan for Upgrade to wastewater treatment system at the "UNISGAL" metallurgy company in Konjic

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Set up and exploitation	Chlorination level	On site, chlorination station/unit	Chlorine dozers, measurement of chlorine, content in treated wastewater	Measurement of chlorine content in treated wastewater in accordance with chlorine dozing regime (continuous or batch-wise)	Protection of recipient flora and fauna	Included in operational costs (chlorination dozer: approximately 400 KM; chlorine-in-water meter: approximately 300 KM	WWTP Operator – UNISGAL
Set up and exploitation	Disposal/treatment of residual solid products (sludge) from WWTP	On site, around site	Visual inspection, laboratory analyses	Every batch, in accordance with internal sludge management plan	Prevention of environmental pollution	Included in operational costs	WWTP Operator – UNISGAL

Table 5.26.: Environmental Monitoring Plan for Upgrade to wastewater treatment system at the "UNISGAL" metallurgy company in Konjic

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Set up and exploitation	Quality of recipient	Downstream of effluent discharge point	Visual/sensory inspection, simple routine analyses of recipient samples	Visual inspection: daily/weekly; Laboratory analyses: monthly of twice a month	Prevention of recipient pollution	Included in operational and maintenance costs, plus laboratory analyses costs, approximately 500 KM	WWTP Operator – UNISGAL, if not satisfied, Cantonal water inspector has to be informed and act in accordance with its obligations and legal requirements

Institutional Strengthening

- **Training**

Table 5.27.: Summary of Training Proposed

Type of training	Training methods	Duration of training	Remarks	Costs/KM	Participant
Training on environmental monitoring -Training on applicable environmental regulations (focusing on water issues) -Training on environmental monitoring -Technical monitoring on equipment use and maintenance	The training should be organized on site[10]	5 days	Local Consultant 20 man/days literature and handouts	15000	Metallurgy company management
WWTP Equipment operators - Safe handling, storage and use of chemicals - Maintenance of equipment - Special training for Wetland operating - Gaining new knowledge on water use and management - Introduction of new equipment and its technology, - Equipment use, safety and efficiency	The training should be organized on site[9]	22 days	Two sessions for maintenance in vegetative and non vegetative period of year	Including in purchasing of WWTP	Metallurgy company management

[10]The training includes theoretical lectures, but to focus on active participation and interaction of the trainees, coupled with specific examples.

- **Equipment purchase**

Table 5.28.: Monitoring equipment

Type of equipment	Units	Unit Cost (KM)	Total Cost (KM)	Local or international purchase
Portable Conductivity meter	1	600	600	Local
Portable Dissolved O_2 meter	1	700	700	Local
Portable pH meter	1	500	500	Local
Calibration solution	3	100	300	Local
Digital Photo	1	400	400	Local

5.2.7. Improved Dam Safety At The Alagovac Dam

Description of activity: The analysis of dam safety on the Neretva and Trebišnjica Rivers made during project preparation has established satisfactory operation and maintenance of the dams in the river basins with the exception of the Alagovac dam (RS). The Alagovac dam, Nevesinje municipality (RS), is the only dam in the NTRB lacking equipment for dam safety monitoring. The dam itself is located in a seismically active area. Installation of proper equipment would allow for proper reaction upon registration of earthquakes in the area. This would facilitate networking of seismic stations on dams into a unified information subsystem within the Water Information System.

The dam was constructed in 1964, forming the artificial accumulation lake of overall volume of 2,5 x $10^6 m^3$. The construction height of the dam is 19 meters; the width at the crown is 180 meters. Therefore, due its height, this dam falls into the category of high dams. It is metalled land dam water supply. Public company "Water supply and sewage system" – Nevesinje operates the dam. There is no technical surveillance of the dam.

Technical surveillance system of the Alagovac dam has never been established, except for the 4 piesometric drills for water level measuring in the body of the dam. However, these measuring have been totally neglected. Based on this, one could conclude that the surveillance system has been totally neglected and that it is inadequate for the category and the significance of the facility.

It is necessary to construct the new surveillance facilities in order to obtain basic parameters of the dam's operations, which are important for the safety, and the use of the facility. In view of the importance of these problems, the technical surveillance project of the Alagovac dam should be developed.

5.2.8. Wetlands restoration in Hutovo Blato

This activity will finance infrastructure to regulate the water regime in the Krupa River within Hutovo Blato Nature Park in order to restore natural wetlands in the Park.

Main objective of this activity would be flora and fauna protection and prevention of salinity impact on Nature Park "Hutovo Blato". Dam would regulate water in wetland ecosystems, as a main factor in creation and survival of these significantly important habitats. Many plants and animals would be no longer endangered as they are today. Dam construction would regulate as well waters from existing HPP Čapljina, which do major damage to fish, birds and plants. Last couple of decades, after construction of dams on river Neretva, wetland ecosystems remain temporarily without the part of ground waters that would be a mud fertilizer, as a consequence of increasing occurrence of small waters in Neretva during summer periods and penetration of salt water and from sea ecosystems into wetlands.

Dam construction in protected wetland is a priority and recommendation of expert team of Project LIFETCY 99/035 BIH, named "New policy of Hutovo Blato Nature park management that was supported by EU in financial means in order to protect entire flora and fauna of this area.

Mitigation Plan and Environmental Management Plan

Mitigation Plan and Environmental Monitoring Plan for wetlands restoration in Hutovo Blato are given in Tables 5.29. and 5.30. below.

Table 5.29.: Mitigation Plan for Wetlands restoration in Hutovo Blato

Phase	Action	Mitigation Measure	Remarks	Costs	Institutional Responsibility
Construction	Temporary disturbance of water line	Assuring minimum biological flow on construction location	It could be necessary to make separate by pass during construction works at the point of dam placement	Minor	Contractor – to be selected in public procurement procedure
	Construction works may generate higher concentrations of dust and noise levels	Usage of covered trucks during transport, immediate removal of materials, minimization of site works in terms of size of construction area and storing materials on greater distance from the location in order to preserve nearby vegetation and animal species		Included in construction costs	Contractor to be selected in public procurement procedure and if needed, environment supervision

Table 5.29.: Mitigation Plan for Wetlands restoration in Hutovo Blato

Phase	Action	Mitigation Measure	Remarks	Costs	Institutional Responsibility
Construction	Fuel and grease spillage may cause pollution of underground waters and soil	All equipment and vehicles have to be maximum 7 years old and/or 5000 working hours. Also, all equipment and vehicles have to be in good technical condition, with certificate issued by authorized institution.	Mitigation measure has to be taken into account when making the selection of contractor.	Included in construction works plus cost for the supervisor	Contractor, Investor and Environmental supervisor
Construction	Removed material and/or construction wastes may pose an environmental threat if not disposed of properly.	All materials have to be placed away from construction site and transported and landfilled at a sanitary landfill.	WB Environmental supervision may be needed	Approximate transport costs are 1 KM/ton *km Disposal costs: 80 KM/ton on sanitary landfill	Environmental inspector must ensure all regulations and procedures are met.
Construction	Construction works may cause disturbance in aquatic and terrestrial fauna life cycle	Perform all construction works out of time frame of nesting, coupling and spawning (reproduction cycle) and in minimal period of time – maximum 60 days.		Minor	Investor

Table 5.29.: Mitigation Plan for Wetlands restoration in Hutovo Blato

Phase	Action	Mitigation Measure	Remarks	Costs	Institutional Responsibility
Operation	Dam operation may cause disturbance in water course	Control spillway and maintain minimum biological flow. Regular maintenance		Operational costs of Nature Park	Investor / Operator

Table 5.30.: Environmental Monitoring Plan for Wetlands restoration in Hutovo Blato

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Construction	Number of species	On the location – upstream and downstream from the dam location	Visually, counting method and biological analyses	Before start of construction works in vegetation period of year	To get in insight in situation at the location	10.000,00	Investor /Operator
	Concentration of dust and noise levels	On the project activities location and around it	Visually and by listening. If higher concentrations of dust (respiratory problems etc.) and irritating levels of noise occur, perform measuring	Daily, during construction works	Protection of NP habitats	Included in construction costs, plus cost for the supervisor	Contractor and Environmental supervisor

Table 5.30.: Environmental Monitoring Plan for Wetlands restoration in Hutovo Blato

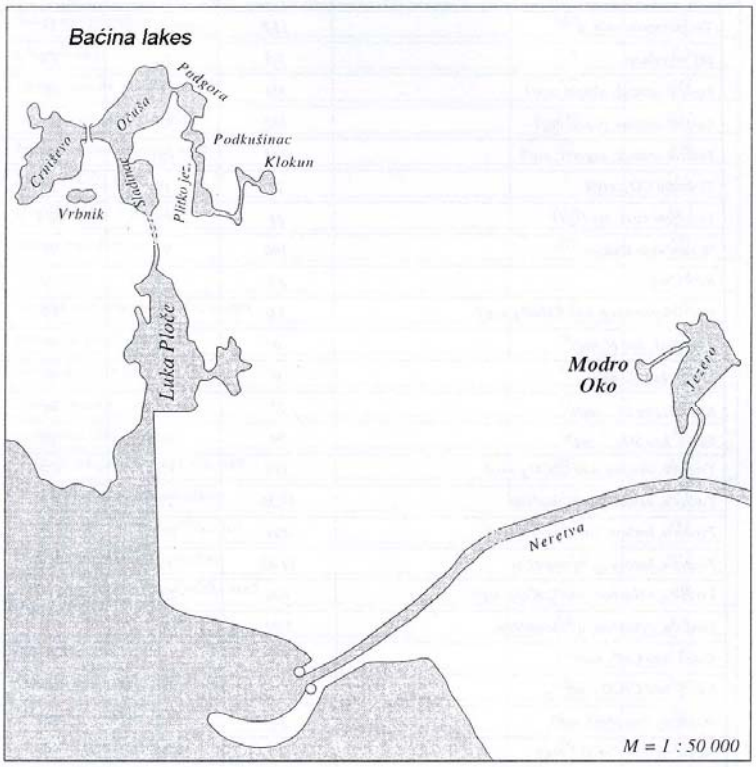
Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost / KM	Responsibility
Operation	Number of species	On the location – upstream and downstream from the dam location	Visually, counting method and biological analyses	Six months after finalization of construction but in vegetation period	To get in insight in situation at the location when dam is working	10.000,00	Investor /Operator
	Number of species	On the location – upstream and downstream from the dam location	Visually, counting method	Once a year in vegetation period	To get in insight in situation at the location when dam is working	1.000,00	Investor /Operator

5.2.9. Improvement of tourist site at Baćina lakes

Description of present situation: Baćina is a settlement in southern Dalmatia (Croatia), 7 km distant from city of Ploče. The Baćina lakes, situated near the city of Ploce in Croatia, are a group of 7 karst lakes (Crniševo, Oćuša, Plitko lake, Podgora, Sladinac, Sipak and Vrbnik). According to the Ploče master plan, Baćinska lakes are designated as a recreational/tourism area. This site currently supports ad hoc and relatively uncontrolled tourism.
Baćina lakes are supplied with water trough permanent and temporary springs. The biggest spring is Klokun, which runs into Plitko jezero. Klokun is abundant in water, from 70 to 480 l/s and it is used for water supply of Ploče. Great amount of water flows into the Lake Podgora through drainage tunnel and channel dug in 1938, used for drainage of waters from the Field of Vrgorsko. In summer, this channel dries up. There are some permanent and temporary springs on the coast of certain lakes, also running into Baćina lakes.
Water from the area of Baćina lakes (Klokun) is used for supplying Ploče. Water supply pipes connect Gradac, Brist, Podaca, Baćina, Ploče, Rogotin, Šarić-Struga, Banja and Komin.

Description of activity: The project would finance preparation of a site management plan; and establishment of environmentally sound recreational and education offerings. It will finance rehabilitation of a building to serve as a visitor/education center; a 3 km trail around the lakes; ramp construction; watch towers; and preparation of souvenirs and brochures.

Picture 5.3.: View on a house at Baćina lakes



Picture 1. Baćina lakes and Modro Oko

Picture 5.4.: Baćina Lakes and Modro oko

Mitigation Plan and Environmental Monitoring Plan

Mitigation Plan and Environmental Monitoring Plan for activities to be performed on Baćina Lakes are given in Tables 5.31. and 5.32. below.

Table 5.31.: Mitigation Plan for Improvement of tourist site at Baćina Lakes

Phase	Action	Mitigation measures	Remarks	Cost	Institutional Responsibility
Preparation	Continuous arrival of the visitors	Timely public information to stop visitors from coming during the closure of existing plant and construction period		Minor, only for advertising	Operator
Construction	Damage of trees and other vegetation during construction activities	Minimize vegetation clearing. Restore and reforest all damaged trees or vegetation after completion of works		Included in construction works	Contractor and Environment supervisor
	Autochthones materials and architecture	Using original material as stone and wooden pillars		Included in construction works	Contractor and Environment or Civil engineer supervisor
	Construction works may generate higher concentrations of dust and noise levels	Usage of covered trucks during transport, immediate removal of materials, good organization of site works		Included in construction costs	Contractor and Environment or Civil engineer supervisor
	Fuel, grease and chemicals spillage may cause pollution of underground waters and soil	Control of equipment and vehicles. Isolate and clean the location in case of spillage. Solidification of spilled liquids using adequate materials.		Included in construction works	Contractor

Table 5.31.: Mitigation Plan for Improvement of tourist site at Baćina Lakes

Phase	Action	Mitigation measures	Remarks	Cost	Institutional Responsibility
Set up and exploitation	Regular discharging of sewage tank	Use adequate car for discharging – sewage tank		Approximate transport and disposed of costs are 400 HRK/tone (in region)	Environmental Inspection and Operator
	Incidental discharge of wastewaters not complying	Continuous control of equipment and waste water level in tank		Included in wastewater treatment plant costs	Operator

Table 5.32.: Environmental Monitoring Plan for Improvement of tourist site at Baćina lakes

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost	Responsibility
Construction	Concentration of dust and noise levels	On the project activities location and around it	Visually and listening. If higher concentrations of dust (respiratory problems etc.) and irritating levels of noise occur, perform measuring	Daily, during construction works	Protection of NP habitants and workers	Included in construction costs	Contractor
	Proper disposal of materials	On the project activities location and around it	Visually	During and at the end of construction works	Protection of ground and surface waters,	Included in construction costs, plus costs for transport of waste materials	Contractor and Environmental supervisor

Table 5.32.: Environmental Monitoring Plan for Improvement of tourist site at Baćina lakes

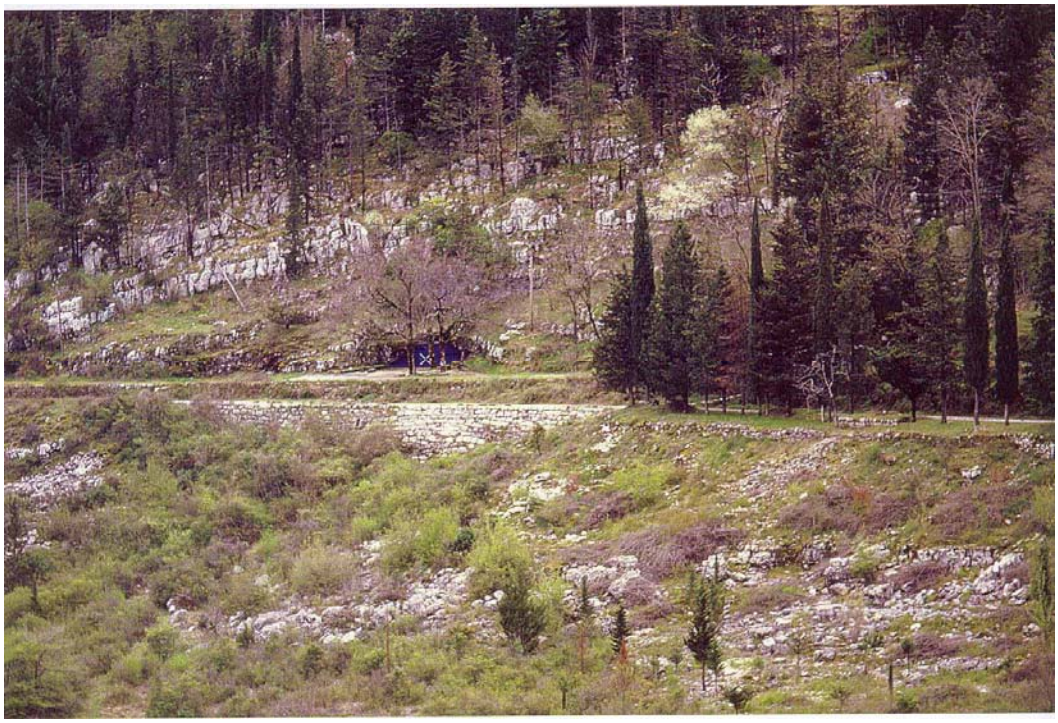
Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost	Responsibility
Construction	Fuel, grease and chemicals spillage	Below and around material storage	Visually in order to determine spillage; in case of major spillage it is necessary to make analysis at the site.	Daily, during construction works	Ground and surface waters protection	Included in construction costs,	Contractor
Set up and exploitation	Improper work of eco trail and sewage tank	On the location. .	Visually,	During operation	Protection of surface waters and habitats	Included in plant operation costs. Possible	Operator

Institutional Strengthening

- Training
No training is necessary for this activity.

5.2.10. Improvement of tourist site at Vjetrenica Cave

Description of current situation: Vjetrenica Cavern is located at the western end of the Popovo polje. From the entrance to the cave, there is a nice view on the Popovo polje, with the typical shape of a flat fertile soil and bare, steep limestone hills surrounding it. At the entrance to the cave there is a massive iron bar gate. There are paths inside. The cave was electrified, but the lines were destroyed during the war in the mid 1990s. The tourist section of the cave consists mainly of a huge passage. In some parts of the cave, there are rim stone pools on the floor. In times of very wet weather the water rises in the inner part of the cave (beyond 700 m). There are many streams and lakes; the largest one is Veliko jezero (Great Lake), about 180 m long and 1250 m from the cave entrance. The colour of the rock is mainly reddish-brown or red, caused by the red iron oxide. This cave is a blowing cave or a wind cave, and that is what its name stands for. The cave system is rather huge, and differences in temperature and air pressure make air flow in and out of the cave. The direction depends on the season, and the outside temperature. The wind blows rather strong, it can reach velocity of more than 10 m/s.



Picture 5.5.: Access road to Vjetrenica Cave

Nowadays this cave is famous for its cave life. The Vjetrenica Cave contains at least 80 types of stygobites and troglobites, which make it one of the most diverse caves in the world. The most famous troglobiont (cave animal) in this cave is the olm (*Proteus anguinus*). And the cave also contains the bones of extinct animals, such as cave bear (*Ursus spelaeus*). The most significant finding was the discovery of a complete skeleton of a leopard (*Panthera pardus*).

The name of the cave means Wind Cave, the reason for which is immediately obvious, when one arrives at the entrance. A howling gale at about 10.6°C flows from the cave, and into the cave in winter. Over the past hundred or so years, Vjetrenica has been visited by thousands of tourists. Since 1964 the cave has had electricity up to a distance of about 1000 m. There were guides, a motel. Souvenirs could also be purchased here. During the fighting in 1991, the tourist equipment was destroyed. Now, it is reopened for tourist again. Many questions about the origins, development and length of Vjetrenica still await answers from scientists. Regardless of this, Vjetrenica offers a special glimpse into the soul of the Earth, which breadth in many ways depends on the eye of beholder.

Since Vjetrenica cave is of great importance for Bosnia and Herzegovina as described above, it is very important to preserve authentic setting of the location. That means usage of natural materials that would not endanger natural outlook of the location. Also, it is very important not to construct access road close to the cave (It should be at least 500 m away from the cave's entrance).

Description of activity: The aim of this activity is to protect the existing cave ecosystem by improving the tourist usage and establishing protection methods for the ecosystem. The project will finance preparation of a management plan which includes establishing zones of protection; infrastructure supporting tourism focusing on educational offerings; environmentally friendly infrastructure including special lighting, trail material, and waste management systems; and promotional and educational materials.

Mitigation Plan and Environmental Monitoring Plan

Mitigation Plan and Environmental Monitoring Plan for activities to be performed near Vjetrenica Cave are given in Tables 5.33. and 5.34. below.

Table 5.33.: Mitigation Plan for improvement of tourist site at Vjetrenica cave

Phase	Action	Mitigation measures	Remarks	Cost	Institutional Responsibility
Construction	Construction causes a lot of disruption	Clearly post information signs around construction area. Limit construction to regular time intervals Allocate possible alternative routes for tourists.	Recommended construction before tourist season	Included in construction costs	Constructor
	Chance findings of monastery and villa	Arrange necessary site preservation measures and contact authorities	Use of hydro pneumatic hammer is strictly forbidden	Minor	Contractor
	Noise and vibration disturbances due to construction works	Limit construction activities to regular daytime intervals.	Use of any quantity of explosive is strictly prohibited.	Included in construction costs	Contractor
Construction	Construction activities may generate dust	Sprinkle earth with water to prevent generation of dust Use protective covers for certain areas with increased dust generation		Minor	Contractor

Construction	Removed material or former asphalt may cause an environmental threat if not disposed of properly.	All material need to be disposed of to the landfill		Minor	Contractor
	Pollution of earth by fuel, and bitumen	Periodically check technical condition of machines and all equipment. Handle cautiously with stored fuel, lubricant, bitumen etc. cautiously. Any spills must be contained and cleaned up.		Minor – included in construction costs	Contractor and environmental supervision
	Open areas must be cleaned after completion of construction	All materials must be disposed from other areas where such material may be in excess.		Minor – included in construction costs	Contractor and environmental supervision
Set up and exploitation	Place sewage tank in the vicinity of the visitor's centre.	All sewage needs to be disposed of in an environmentally sound manner. It has to be transported to Trebinje or Neum for treatment and disposal.	Necessary to make long-term agreement for transport, treatment and disposal of sewage sludge, with communal companies of Trebinje or Neum	In accordance with local process.	Management of Vjetrenica cave
	Regular discharge of sewage tank	Use proper car for discharging –sewage tank and transport it to the landfill		200 KM/tone of sludge, transport to Neum or Trebinje	Municipality

Table 5.34.: Environmental Monitoring Plan for improvement of tourist site at Vjetrenica cave

Phase	Parameter to be monitored	Where is the parameter to be monitored	How is the parameter to be monitored	When is the parameter to be monitored	Why is the parameter to be monitored	Cost	Responsibility
Construction	Chance findings of monastery and villa	On the place of construction	Visual inspection during construction works	Daily during construction works	Protection of cultural heritage	None	Contractor and Inspection
	Improper work of eco trail and sewage tank	On the location. .	Visually,	During operation	Protection of surface waters and habitats	Included in plant operation costs. Possible	Operator

Institutional Strengthening

- **Training**

No training is necessary for this activity.

6. ANALYSIS OF ALTERNATIVES

During preparation of wastewater treatment activities different alternatives were considered for each project location. They are shown and described briefly in the following text.

6.1. Alternatives for Konjic municipal wastewater collection

In order to solve a problem, since the city of Konjic is the major polluter in the basin of the Neretva, and largely affects the quality of water of the Neretva and Jablanica Lake, alternative solutions have been sought since 2005 by using bio-filter modules (rotating biological contactor) on main outlets.

Due to the terrain configuration, it was concluded that an installation of rotating biological contactor would be very complex both from the technical and construction perspective, and such an option was practically rejected, that is, the option of installing only one such device on the location where it is relatively easy to place such device was selected.

Cost and benefit analysis for the wastewater treatment plant in Konjic takes into account two alternatives with different values of income. Case 1 considers the charged fees for wastewater collection as the only direct income, and represents the worst-case scenario for the cost-effectiveness of the project.

On the other hand, Case 2 was developed through the review of EU standards, and taking into consideration indirect incomes, that are significantly larger than direct incomes, but do not affect the cost-effectiveness of the investment.

Results of the latter analysis may not reflect the actual conditions of BiH in meeting the economic conditions as assumed in the analysis, and the reality may be much closer to the starting assumptions used in the Case 1.

6.2. Alternatives for Bileća municipal wastewater collection

Three cases of the wastewater treatment facility for Bileca municipality were considered and proposed.

- **Case 1:** Modern option based on conventional technology - Considering the need for environmental protection of Bilecko Lake, which serves as a source for the regional water supply system, it is proposed to treat municipal and industrial wastewaters with a biological-mechanical treatment system that employs activated sludge in an extended aeration process. In this system, removal of organic pollutants and sludge stabilization occur in the same bio-aeration tank, producing stabilized sludge that can be safely disposed at a landfill or a disposal site.

- **Case 2:** Biological treatment facility based on SBR Technology - A modern biological treatment plant based on Swedish SBR (Sequencing Batch Reactor) technology could be proposed as a solution for Bileca. This type of plant is convenient because it does not require a large surface area and its tanks are placed on the ground, which is suitable for terrains with high groundwater tables. No secondary settling tanks for separation of water and activated sludge are necessary in these facilities, since aeration reactors work in an alternating fashion with aeration and after aeration is completed they are used as settling tanks or are filled with new water. Installation requires only a minimum of ground removal work (only what is necessary for foundations of devices) and concrete tanks are assembled from concrete components, which are made on site. Treatment efficiency is high: effluent has less than 10 mg/l BOD_5 and 20 SS, and 60–90% of nutrients are removed.
  Treatment plant capacity (phase I): 10,000 PEI (final capacity: 18,000 PE).
  Hydraulic capacity: 2,500 m_3/day.
  Aeration system: diffuse aeration.
  Treatment system: biological (SBR - Sequencing Batch Reactor – activated sludge modification).
  Sludge treatment: aerobic stabilization and removal of water at centrifuges.

- **Case 3:** Installation of 3 rotating biological contactors - One of the options is a phased solution, where each phase would represent a finished project, resulting in reduction of pollution of Bilecko Lake. Smaller compact treatment devices of the rotating biological contactor type are also proposed. There would be one plant for 5,000 PE and two plants, each for 2,000 PE (total 9,000 PE). The wastewater treatment device is designed to have seven parts, which together make up a complete solution for wastewaters. The system is sized for 5,000 PE with the possibility of not using certain parts of the system depending on the season and loading, which means that it is not necessary for the system to work at full capacity. The system can be expanded by adding new rotating biological contactors, if there is an increase in PE.

Conclusion: It is better for Bileća to build a classical biological wastewater treatment plant for 10,000 PE, which can handle pre-treated industrial waters and a part of precipitation waters from the mixed sewage system. This would satisfy the town needs for at least 15 years.

6.3. Alternatives for municipal wastewater treatment in Ljubuški

For this activity, only economy alternatives in terms of investment recovery and financing were analysed.

Cost and benefit analysis for the wastewater treatment plant in Ljubuški takes into account two alternatives with different values of income. Case 1 considers the charged fees for wastewater collection as the only direct income, and represents the worst-case scenario for the cost-effectiveness of the project.

On the other hand, Case 2 was developed through the review of EU standards, and taking into consideration indirect incomes, that are significantly larger than direct incomes, but do not affect the cost-effectiveness of the investment.

Results of the latter analysis may not reflect the actual conditions of BiH in meeting the economic conditions as assumed in the analysis, and the reality may be much closer to the starting assumptions used in the Case 1.

6.4. Alternatives for industrial wastewater treatment in "SurTecSjaj" mettalurgy company

Alternatives in terms of technology were not analysed.

Cost and benefit analysis for the wastewater treatment plant in Konjic takes into account two alternatives with different values of income. Case 1 considers the charged fees for wastewater collection as the only direct income, and represents the worst-case scenario for the cost-effectiveness of the project.

On the other hand, Case 2 was developed through the review of EU standards, and taking into consideration indirect incomes, that are significantly larger than direct incomes, but do not affect the cost-effectiveness of the investment. Results of the latter analysis may not reflect the actual conditions of BiH in meeting the economic conditions as assumed in the analysis, and the reality may be much closer to the starting assumptions used in the Case 1.

6.5. Alternatives for industrial wastewater treatment in "UNISGAL" mettalurgy company

Alternatives in terms of technology were not analysed.

Cost and benefit analysis for the wastewater treatment plant in Konjic takes into account two alternatives with different values of income. Case 1 considers the charged fees for wastewater collection as the only direct income, and represents the worst-case scenario for the cost-effectiveness of the project.

On the other hand, Case 2 was developed through the review of EU standards, and taking into consideration indirect incomes, that are significantly larger than direct incomes, but do not affect the cost-effectiveness of the investment. Results of the latter analysis may not reflect the actual conditions of BiH in meeting the economic conditions as assumed in the analysis, and the reality may be much closer to the starting assumptions used in the Case 1.

7. ENVIRONMENTAL FRAMEWORK GUIDELINES

Available data for some of the planned projects are not sufficient enough and on the appropriate level for preparation of EA and EMP and therefore, Environmental Framework Guidelines are given here.

Detailed EIA (if necessary) and EMP will be elaborated for each of potentials projects, during project development.

7.1. Environmental Framework Guidelines for Small Grants Program

In order to avoid possible negative environmental impacts of certain activities under up to date insufficiently detailed projects, Environmental Framework Guidelines are proposed within small grant projects.

With respect to the WB safeguard policy, the following procedure is proposed:

Because of relatively limited number of possible different projects (type of activity, scope, location) and bearing in mind that the most of the projects are very small, that they all fall under category B, that they do not require EIA or EA, nor WB procedures or national obligations, and that all of them will contribute to the environmental improvement, simplified procedure is therefore proposed.

In order to easily evaluate projects being subjects of small grants up to few thousand dollars, Client proposal has to be unified and as simple as possible, so that a Client itself, to the greatest possible extent, can prepare it.
Format given in Table 7.1 is proposed to be reviewed and introduced in the Operational Manual.

Table 7.1.: Format of Client proposal to be included in Operational Manual

(For each type of selected project-to-project activities sample shall be prepared)
Client: Name, address, status
Sub-project: Name and location

Description of present situation

Description of location: (half to one page) purpose of land **–** land use plan**,** properties right, surrounding, geographical position, hydrology, access to transport infrastructure, soil, level of potable water, nature – flora and fauna, protected areas, important cultural monuments; archaeological heritage; ……

Relation to Physical Plan: Physical Plan exist/does not exist / is not needed; location already included as a special requirement as per Physical Plan, if any

State of environment: sewage system exist/does not exist; solid waste disposal exist/does not exist; air pollution; impact of other/existing industry/plants; state of transport facilities;

Description of planned activities

Description of activities: (half page – What? How many? …….)

Land (which surface will be under crop/activity)

Used raw materials: for each type of materials, including water and chemicals (quantity/year; quantity/day; storage facilities)

Energy type and source: What kind? How many?

Products: product (quantity)

Solid waste: type and quantity; disposal solution

Waste water: type and quantity; disposal solution

Air emissions: type and quantity

Noise: source and impact on residential area

Transport: access to transport facility;

EXPECTED IMPACT

Relation to BiH or/and Croatian EIA practice: checking of the planed activities against the List of the NTRP activities for which EIA is required and if required, against the List of Intervention requested EIA (Regulation on EIA of BiH and Croatia) and checking of planned activities against Bank's exclusion list of activities forbidden for financing.

DECISION

EIA is required/not required; if YES complete/target EIA is required /not required

Additional criteria: EMP, Good practice recommendation, Mitigation measures, Monitoring (i.e. called EMP in WB)

Anyhow, for each of the planned projects, the PIU shall compare proposed activity with respect to the WB safeguard policies and categorization of the projects in group A, B, or C, but also having in mind that the WB forbids financing of some types of activities.

Table 7.2.: EIA Procedure

ENVIRONMENTAL IMPACT ASSESSMENT generally consists of the following steps:

Screening – to determine whether or not proposed activities should be subject of EIA and, if so, at what level of detail

Scoping – to identify the issues and impacts that are likely to be important and to establish the terms of reference for EIA

Impact Analysis – to identify and predict the likely environmental, social and other related impacts of the proposed activities

Mitigation and Impact Management – to establish the measures that have to be avoided, minimize or offset predicted adverse impact and, where appropriate, to incorporate these into an environmental management plan or system

Evaluation of Significance – to determine the relative importance and acceptability of residual impacts (i.e. impacts that cannot be mitigated)

Monitoring – to control efficiency of proposed measures

For the activity preliminary screening related to national criteria will be performed. If the proposed activity is the subject of the EIA (according to the BiH and Croatian practice), the screening process is hereby completed. This means that EIA must be developed. If the proposed activity is not the subject of the EIA according to the national practices of BiH and Croatia, the borrower shall undertake secondary screening according to the WB practice.
If there is any uncertainty (concerning the size and type of the projects), on the World Bank classification of activities related to exclusion, the PIU must seek the opinion of the World Bank.

If the proposed activity belongs to the Category A <u>the activity will be excluded from financing by the project.</u>

Preparation of EIA

For the project activities categorized as A or B and/or for project activities, which are subject to EIA according to BiH and Croatian law, EIA must be prepared. Nevertheless, although the format of the EIA document of the Bank and BiH and Croatian is almost the same, it will be an advantage if all requirements are to be met in the same document. The efficiency could be achieved if licensed institutions for the EIA preparation in BiH (currently only in the RS) and Croatia are familiar with the Bank safeguard policies and procedures. The Project can finance training for each responsible officials and at least one licensed institution (currently only in the RS) on the Bank World Bank safeguard policy with a particular emphasis on the screening process.

For each Canton, at least one licensed institution for preparation of EIA shall be selected for required EIA in the NTRB project and trained on Bank safeguard practice. Licensed institution shall, if needed, work closely with the PIU and borrower.

The environmental permitting process in BiH and Croatia is established. However, not sufficient care on environment and sustainable development is undertaken, particularly by small-scale projects. It could happen, especially with a project for which the EIA is not required, that environmental standards would not be met and that most appropriate environmental practice would not be introduced, because screening is not mandatory for projects which do not require EIA.

Nevertheless, for all NTRB activities with possible environmental impact screening is foreseen. It is proposed that experienced environmentalist shall do this or licensed institution.

For this purpose it will be very useful if the PIU contracts or executes site visits for each relevant project activity, even if law does not require the EIA: e.g. scale of the plant and expected moderate environmental impact.

It is known that most rural areas in BiH and Croatia are lacking minimum municipal infrastructure as for example: sewage system and solid waste disposal sites. Experts can suggest minimum mitigation measures to the Client that can help sustainability of the project and also present additional guarantee for the Bank (e.g. in case there is no central sewage system, construction of environmental friendly septic pit is recommended; if there is no organized solid waste disposal, measures for minimizing waste production and/or composting of organic waste should be imposed). Such proposed mitigation measures, based on the local principle so called "Best Available Technology Not Entailed Enlarged Costs" (BATNEEC) shall be introduced in the project, as a mandatory measure.

For each type of the project activity, the PIU can prepare a "good practice guidelines". These shall not be prepared in advance for all possible activities. They will be worked on a "case by case" basis with periodic updating of the "good practice guidelines".

Site visits for each relevant project activities shall be organized. During the screening process, project activities shall be linked to good environmental practice.

In case that the EIA is required, the Client must submit to the borrower official documents issued by the Ministry.

NOTE: The activity cannot start before the Location and/or Construction permits are issued!

Protection of cultural heritage, chance finds and landscape

According to the BiH (both the Federation and the RS) and Croatian cultural heritage protection practice, building permit will usually contain provision about the chance findings and protection of cultural heritage, particularly if the planned activities are related to digging and other activities, such as restoration (of old buildings). It could happen that authorities will not require construction permit. The borrower shall

screen if chance findings can be expected during the particular project and if there is a need for protection of cultural heritage. If need be, request that particular provisions are included in the Contract with the Client.

To protect the value of the environment, the landscape should be taken care in particular. The landscape can be affected by reconstruction and rehabilitation activities and/or by construction of new buildings. However, it should be requested that the construction works comply with culture and tradition of constructing in that particular area. The building permit usually covers this. The borrower shall check if the provision about the landscape protection is included in the building permit for the related project/s. If not, than it shall request this provision to be included in the contract entered into with the Client.

The borrower shall screen particular projects for provisions regarding protection of cultural heritage, chance findings and landscape, and if needed, include it in the building permit.

In BiH and Croatia, the EMP is mandatory only for projects for which the EIA procedure was met. Licensed institution based on "case by case" practice could prepare templates for EMP.

7.2. Environmental Framework Guidelines for Salt Water Intrusion

7.2.1. Objectives

The objectives of this pilot scheme are (i) to identify and elaborate a sustainable solution for the reduction of negative impacts through salt intrusion (salinity assessment study); and (ii) to apply recent research results and modern irrigation technology as well as good agricultural practice on a pilot area of about 400 ha to increase and maintain sustainable crop production.

The proposed pilot scheme "Salt Intrusion in the Neretva Delta" will consist of two parts:

1. a salinity assessment study as an input to the preparation of the Neretva-Trebisnjica River Basin Management Plan; and
2. a rehabilitation/development of about 400 ha of irrigated land for improved agricultural production and sustainable land use practice in the Neretva Delta.

It is prudent that this rehabilitation will be in an agricultural production area which will not be negatively affected from whatever the final solution of appropriate land and water management in the Delta will be according to the future River Basin Management Plan (RBMP).

7.2.2. Environmental Considerations

In coastal aquifers, sea water intrusion is common. It is a natural process, but it becomes an environmental problem when low quality water is used for irrigation purposes. This problem is exacerbated by the karst features in the catchment areas which control the variation of river flows draining towards the Adriatic Sea, and by hydropower production and water diversions. This is particularly evident in the Neretva Delta, where farmers who grow mostly vegetables and fruits have no alternative water source, and thus use saline groundwater for irrigation purposes, thereby potentially degrading the soil and lowering crop yields. The problems caused by sea water intrusion and subsequent soil salinity have become particularly acute over the past few years, particularly for farmers whose revenues depend on agricultural production in the Neretva Delta.

The design of this pilot will have accompanying measures such as the provision of extension, the introduction of Integrated Pest Management (IPM), and on-farm water management assistance which will help to optimize the use of the existing land and water resources without negatively affecting the environment, and thus enhancing sustainability.

7.2.3. Expected Outputs

The Salinity Assessment Study is expected to produce the following outputs:

- Collection and analysis of existing reports and data (particularly most recent research results);
- Survey and mapping of soil salinity;
- Extension and operation of the existing surface and groundwater observation network;
- Establishment of a mathematical simulation model for water management (quantity and quality) in the Neretva Delta
- Delineation of potential land use as a function of soil salinity;
- Socio-economic appraisal of the situation of the population using land and water resources in the Delta;
- Appraisal of the proposed technical options to reduce salt intrusion; and
- Integration of the study results into the Neretva-Trebisnjica River Basin Management Plan.

The Rehabilitation of some 400 ha of irrigated areas in the Neretva Delta is expected to produce the following outputs:

- High degree of farmers' participation in design and implementation of irrigation and drainage infrastructure as well as in on-farm water management;
- Adequate irrigation and drainage infrastructure and a sustainable operation and maintenance system on about 400 ha of suitable land;
- Application of good agricultural practices;
- Higher yields and income; and
- Sustainable management of land and water resources for irrigation purposes.

7.2.4. Implementation Arrangements and Time Table

The detailed design of this pilot scheme will be carried out during the first project year. As a result of this, the selection of the priority area will be finalized, which will be in either Glog or Vidrice in the Opuzen Usce area of the Neretva Delta. The 440 ha in the Glog area were reclaimed in the early sixties and are characterized by a functioning drainage system of open canals including the main drain pumping station and guaranteed electricity supply. The agricultural production in that area consists of citrus plantations, which are about 35 years old. The irrigation infrastructure is insufficient, and farmers are interested in more profitable agricultural production. The 430 ha in the Vidrice area were reclaimed in the eighties and are characterized by increasing salt intrusion over the last years, a drain pumping station discharging at present into Mala Neretva, a lack of irrigation facilities, and an available and guaranteed electricity supply. The agricultural production consists of a few young citrus plantations, and primarily vegetables sensitive to salinity. The farmers have also expressed interests in developing lands for higher yields and income. Both areas can be irrigated from the Mala Neretva as the latter is supposed to be the fresh water reservoir for any irrigation needs in Opuzen Usce. This can also occur independent of whatever solution will materialize with regard to the decrease of the negative sea water intrusion impact, and the required increase of fresh water discharged to the Delta.

The Ministry of Agriculture, Forestry and Water Management will be responsible for the implementation of this pilot scheme, and will eventually delegate responsibilities to national agencies who have already accumulated a considerable amount of knowledge and experience in the Neretva Delta, such as Croatian Waters in Opuzen, the Institute for Adriatic Crops and Karst Reclamation in Split, the Civil Engineering Faculty of the University of Split, and the Amelioration Department of the Faculty of Agriculture of the University of Zagreb.

A preliminary version of the Salinity Assessment Study would be available in 2 years, and would build on data from previous as well as ongoing research activities. The final version, however, would only be available in five years, when additional monitoring results can be used

from the extended and upgraded surface and groundwater observation network. The Pilot Rehabilitation/Development Project would be planned in the first year, implemented in the second year, operated for two years and eventually evaluated after the fourth year. It is essential that the participating farmers are involved right from the outset in the design, implementation, operation, and maintenance of the pilot project.

7.2.5. Estimated Costs

The total cost estimate for the Soil Salinity Assessment Study will be about US$ 300,000 and for the Rehabilitation of Irrigation Infrastructure is about US$1,000,000. As the Neretva Delta is a priority area for future country-wide irrigation development in Croatia, the Government of Croatia (GoC) is ready to co-finance the rehabilitation works and eventually upscale the rehabilitation/development measures once their effectiveness and beneficial impact on crop production and environment is proved.

It is expected that the GoC cofinancing for this sub-component is about US$400,000. It is understood that any intervention planned on arable (and irrigable) land in the Delta will be undertaken with the full participation of the concerned farmers. It anticipated that the beneficiaries will contribute about US$200,000 to cofinance only about 33% of the on-farm equipment. The total estimated cost of the proposed pilot will be about US$1,300,000.

In order to protect environment during implementation of proposed pilot project following approach is suggested:

- Proposed procedure has to be described in details, while special attention has to be given to possible impacts on waters, soil and air during preparation, implementation and closure of pilot project.
- Proposed procedure will be evaluated in similar way as in case of small grants
- In case of any doubts WB will be contacted

Annex 1: Map of Project location and brief profiles of beneficiary countries

Bosnia and Herzegovina and Croatia
Proposed Integrated Ecosystem Management of the Nerteva and Trebišnjica River Basin (NTRB) Project

Picture 1. Map of project location including site of activities

Bosnia and Herzegovina and Croatia
Proposed Integrated Ecosystem Management of the Nerteva and Trebišnjica River Basin (NTRB) Project

Picture 2: Neretva and Trebišnjica River Basins

Bosnia and Herzegovina and Croatia
Proposed Integrated Ecosystem Management of the Nerteva and Trebišnjica River Basin (NTRB) Project

Brief Project beneficiary countries' profiles

Bosnia and Herzegovina (BiH)

The total surface area of Bosnia and Herzegovina is 51,129 km^2 with a border line of 1,537 km (762.5 km terrestrial; 751.0 km river; and 23.5 km sea border). BiH borders the Republic of Croatia in the North and West parts (931 km), Serbia (375 km) in the East part and Montenegro (249 km) in the South-East part. BiH has access to river Sava in the north and to the Adriatic Sea in the south in Neum. The terrain in BiH is mostly highland with the average height of 150 m above sea-level. The climate is mostly moderate continental and Mediterranean. BiH has vast natural resources including forests, ore deposits and water sources.

According to the 1991 census, BiH has 4.4 million inhabitants; the capital is Sarajevo with about 460,000 people.

Croatia (HR)

Croatia is a medium-size European country located in the Southeastern part of Europe and bordering the Adriatic Sea.
The HR area of total 87,677 km^2 includes a mainland zone covering 65 % of the total surface (or about 56,538 km^2), and a coastal sea zone (interior plus territorial sea) covering about 35% of the total surface (about 31,139 km^2). The Croatian total length of the mainland border is 2,028 km. The country borders Serbia in the north-east (241 km); Hungary in the north (329 km); Slovenia in the north-west (501 km); BiH in the lower part of the crescent (932 km), Montenegro in the extreme south (25 km), and Italy and Slovenia around the sea zone (about 930 km).

Croatia has a population of 4,784,265 inhabitants; the capital is Zagreb including about 1 million people.

According to the Constitution, Bosnia and Herzegovina is composed of two entities, Federation of Bosnia and Herzegovina and Republika Srpska and District Brčko, as special administrative unit of Bosnia and Herzegovina. Republika Srpska is divided between Republic and local self-governmental units. In Federation of Bosnia and Herzegovina, besides federal authority, there are ten cantons, municipalities and cities that exist as local self-governmental units.

Republic of Croatia, beside state administration, is composed of regional self – governmental units (counties) and local self-governmental units (municipalities and cities).

The NTRB is located within several administrative regions (national and regional level). Generally speaking, the Neretva watershed is mostly located in the area of the Federation of BiH, whereas the Trebišnjica watershed is mainly located in RS area. Part of the river basin in the area of RH administratively belongs to two RH counties: Split-Dalmatia County in the continental part of the Neretva River basin, and Dubrovnik-Neretva County which covers all coastal part of the river basins with fresh water flow into the Adriatic Sea. Administrative regions in

the NTRB are in Federation of BiH (BiH): the city of Mostar (administrative center of the canton), and municipalities of Konjic, Jablanica, Prozor, Čitluk, Čapljina, Stolac, Neum, Ravno (Herzegovina-Neretva Canton), municipalities of Široki Brijeg (administrative center of the canton), Posušje, Grude, Ljubuški (West Herzegovina Canton); in the Republika Srpska (BiH): municipalities of Trebinje, Ljubinje, Bileća, Gacko, Nevesinje, Berkovići, Kalinovik, Trnovo; and in the Republic of Croatia Cities of Dubrovnik, Ploče, Metković and Opuzen and municipalities of Kula Norinska, Pojezerje, Slivno and Zažablje (Dubrovnik-Neretva County) and municipalities of Vrgorac, Imotski, Zmijavci, Runovići, Lovrec, Proložac, Gradac, Podgora, Tučepi, Zagvozd, Podbablje, Lokvičići (Split-Dalmatia County).

The Neretva River is the longest and the most water abundant river, which flows into the Adriatic Sea on East cost. Its watershed can be seen in three spatial segments starting from the North: the upper Neretva River Watershed, from its source to Jablanica; Central Neretva River Watershed, from Jablanica to Žitomislić and the lower Neretva River Watershed, the bottom stretch to the sea. In the lower basin the Neretva Delta is of particular interest. It is generally characterized as wetlands and its Croatian part was put on the Ramsar list in 1993. The most important part of the Delta in BiH is in the Hutovo Blato Nature Park, which has been on the Ramsar list since 2001. The Trebišnjica River Watershed can similarly be divided into three stretches. The main characteristics of the Trebišnjica River Watershed are high waters and floods in the winter-spring season and lack of water accompanied by droughts during the summer. Underground drainage dominates surface drainage.

There is a diversity of land and water conditions in the Neretva and Trebišnjica River Basin arising from its geographical position, which encompasses both a mild Mediterranean and a harsh continental climate. The upper Neretva Watershed is mountainous and characterized by narrow canyons and rapids, interspersed with large lake/reservoirs created by hydroelectric dams. The high plains of the middle Watershed are remote and characterized by distinctive Karst geology, which resembles an arid moonscape but is in fact surprisingly fertile. Moving toward the lower Watershed the land descends into a landscape of dense green forests, freshwater springs and streams and an abundance of flora and fauna. Further southwards, there is the Trebišnjica River Watershed, which is a major tributary of the Neretva River. It is located in South Herzegovina and the Republika Srpska. Here, there is a strip of Karst land, which levels out towards the Adriatic coast, boasting newly reconstructed villages; several import facilities, extensive flat agricultural lands and productive soils.

Annex 2: Comparison of World Bank Requirements with BiH and Croatia Requirements

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
Categorization/ Screening	FBiH: Categorization and screening is based on lists of installations and facilities requiring environmental permits obtained through either EIA or without EIA. RS: Categorization and screening is based on a list (to be drafted) of projects requiring environmental permits obtained through either EIA or without EIA.	Environmental impact assessment is obligatory for interventions defined in the List of Interventions that is part of this Rule Book. Environmental impact assessment is also required for the reconstruction of plants referred to in par. 1 of this article: - if no environmental impact assessment has been carried out and the intervention' s surface area, size, production and/or power are being increased and the technological procedure, production programmed or the operating power source is being changed; - if environmental impact assessment was carried out, and the intervention's surface area" size, production and/or power are being increased by 30% or more. Environmental impact assessment is obligatory also for the removal or cessation of operation of interventions referred to in par. 1 of this article for which no environmental impact assessment procedure has been carried out. NOTE: Regardless of the above regulation, the obligation to perform an environmental impact assessment could be defined in the physical plan of the County or City of Zagreb; separate and more detailed List of Intervention with obligatory	Screening and categorization is based on type, location, sensitivity, and scale of the proposed project identifying key issues including any resettlement, indigenous peoples, and cultural property concerns.

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
		EIA could be given	
Significant impacts	FBiH: A: Installations and facilities to be assessed for their impact on environment requiring full EIA are defined by secondary legislation. The EIA is a requirement for obtaining an Environmental Permit. RS: A: Projects requiring full EIA will be defined by secondary legislation.	All projects given on List of Intervention have the same category	Cat. A: Projects likely to have significant adverse environmental impacts that are sensitive (irreversible).
Moderate Impacts	FBiH & RS: B: Entity ministries responsible for environment will screen and decide whether an EIA is required. C: Installations and facilities for which Environmental Permit is issued by entity ministries responsible for environment and which do not require a full EA.		Cat B: Projects with environmental impacts less adverse than those of Cat A.
Low or no impacts	FBiH: D: All smaller facilities and installations, which require an Environmental Permit to be issued by responsible cantonal ministry. Secondary legislation defines the size and thresholds of these facilities. By-Law enacted in Sarajevo Canton (OG of Sarajevo Canton 19/04) RS: D: Local administration units (municipalities) responsible for environment, issue environmental permits to facilities (which require an Environmental		Cat C: Projects with minimal or no adverse impacts.

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
	Permit) with threshold levels below A, B, C and those facilities which are not included in A, B and C. FBiH: E: Very small installations and facilities (which do not exceed household emissions) not requiring environmental permits are under the responsibility of relevant cantonal ministries. These thresholds have not been defined yet. The cantons may transfer this obligation to municipalities in the future. RS: E: Installations, which do not require environmental permits.		
EA Documentation/ Document Content	A: Phase I: Prior to environmental assessment needs to be submitted by the project developer to the Federal Ministry (in FBiH)/ Decision request for and EIA to the Entity Ministry (in RS) in order to determine the scope of the EIA study. The assessment/request contains the project description including information about the location, purpose and size of installation, measures to prevent or mitigate possible negative impacts, information required for identification and assessment of basic environmental impacts, copy of spatial plan of the location, non-technical summary	**EIA shall include the following chapters and contents**: Description of the intervention and its location 1. Purpose of undertaking or developing the intervention; 2. Data from the physical planning document; 3. Description of the location environment and impact area of the intervention; 4. Description of the intervention; 5. Assessment of realization costs and work related to the intervention; 6. Description of the relationship between the intervention's executor and the public prior to	Cat A: Full EA is required, normally an EIA. The EMP is an essential part of the EA. EA content for a Cat A project is given in Annex I. (Separate Resettlement Plans and Indigenous Peoples Plans are Disclosed with the EA report)

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
	(non-technical summary is submitted in FBiH only). Phase II (FBiH): The Entity Ministry defines the content and scope of the EIA based on the results of the Prior Environmental Assessment and in accordance with secondary legislation. The Ministry also provides a list of institutions authorized to prepare EIA – not yet prepared and issued in FBiH. Phase II (RS): Following Entity Ministry's decision, the project developer submits a request for preparation of an EIA. Based on the request, the Entity Ministry contracts an authorized institution for the preparation of the EIA, selected from the list of institutions licensed for performing EIA (OG of RS, 02/03)	study elaboration. Acceptability assessment of the intervention: 1. Identification and review of possible environmental impacts of the intervention and its variants during preparation, development and use of the intervention, or cessation of use and/or removal of the intervention, including ecological accident and the risk of its occurrence; 2. Cost-benefit analysis of the intervention; 3. Coordination of the intervention with international liabilities of the Republic of Croatia related to the decrease of inter boundary environmental impacts and/or the decrease of global environmental impacts; 4. Substantiated proposal of the most adequate intervention variant with regard to environmental impact. C. Environmental protection measures and measure implementation plan: 1. Proposal of environmental protection measures during intervention execution and use, or cessation of use and/or removal of the intervention, including the proposal of measures for the prevention and mitigation of consequences of possible ecological accidents; 2. Monitoring programs, if needed, with regard to the state of environment; 3. Environmental protection policy of the	

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
		intervention's executor with a review of objectives and principles of environmental protection actions; 4. Organization structure of the intervention's executor with a review of the total practice, responsibility, procedures and potentials of the intervention's executor for implementing environmental protection measures; 5. Review of the planned cooperation of the intervention's executor with the public during and upon intervention realization; 6. Assessment of costs related to environmental protection measures and monitoring measures related to the state of the environment and their share in the costs of realization and works, or cessation of the intervention's use. D. Conclusion (concise) 1. Rationale of the intervention's most appropriate option; 2. Review of the environmental impact of the selected option of intervention; - environmental protection measures during execution and use, or cessation of use and/or removal of the intervention, including measures for prevention and mitigation of consequences of possible ecological accidents; - monitoring programs, if necessary, related to the state of the environment during the intervention's execution and use, or cessation of use, with argumentation.	

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
		E. The study's summary for public inspection prepared for the general public F. Data sources - Physical planning and environmental protection documents, other planning documents, regulations, statistical reviews, expert and scientific articles, etc.	
	B (FBiH & RS): Activities in this category are also subject of a Prior environmental assessment, where the content of the document submitted is identical to that of A. C (FBiH & RS): Written request for Environmental Permit needs to contain the following: -Name and address of the project developer -Location and description of: installation, facility and activity (plan, process description); raw materials; sources of emissions; site conditions; type and quantity of emissions; key environmental impacts; prevention and mitigation measures; measures for prevention of waste generation; after closure measures; alternatives; request form for other required permits, non-technical summary.	Concerning: **For the reconstruction, removal or cessation of operation of the intervention referred to in art. 3 par. 2 and 3 of this Book of Rules, the elaboration of a study with target contents may be allowed on request of the authorized person.** By a study with target contents specific aspects of environmental impact of the reconstruction and closing or removal of existing interventions are elaborated. The executor of the intervention has to explain the reasons why the elaboration of the study referred to in par. 1 of this article is requested and to propose the objective and contents of the study. A study with target contents may be granted also	Cat B: Scope of EA narrower than Cat. A project. Usually just an EMP is required. Environmental considerations are either incorporated in project documents or are included in a separate report. The Concept Review decides the scope of the EMP and whether any additional environmental requirements are necessary. (Separate Resettlement Plans and Indigenous Peoples Plans are Disclosed with the EA report)

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
		for interventions from the List of interventions Chapter II. Power facilities 2.1. Electric power plants hydro-electric power plants with installed power below 5 MW ;-power plants with unconventional energy sources, installed power below 10 MW and Chapter IX. Facilities in protected areas. The Ministry of Environmental Protection and Physical Planning (hereinafter: the Ministry) grants the elaboration of the study referred to in par. 1 of this article and defines its contents.	
	D (FBiH & RS): Formal written request to Cantonal Ministry responsible for environmental issues (in FBiH)/ Municipal body responsible for urbanism (in RS), has the same content as request for C. The Cantons are authorized to modify the above requirements for D in the Cantonal laws dealing with EA.		Cat C: No EA is required. No action is required beyond screening.
Inter boundary Environmental Impacts	For all projects and installations/facilities that may have negative inter boundary (including inter-entity boundary) environmental impacts the following are required: - The EIA report needs to have a special chapter containing	For all projects and installations/facilities that may have negative inter boundary environmental impacts the following are required: The EIA report needs to have special chapter containing information on possible inter boundary environmental impacts – relation to ESPOO Convention. Also the chapter with the respect to	Notification of riparian may be required if international waterways are involved.

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
	information on possible inter boundary environmental impacts. - The request for an Environmental Permit (and relevant documents included with the request) needs to be sent to relevant entity/foreign state authorities.	other international obligation (Kyoto,) could be required.	
Consultations / Public Hearings	Public consultation is the responsibility of entity ministries responsible for environment for A, B and C, while it is under the responsibility of Cantonal Ministries (in FBiH)/Municipalities (in RS) for D. A: Article 61 of the FBiH Law on environmental protection (and Article 62 in RS) prescribes that the public consultation should take place after the draft EIA study is submitted. However, Article 36. (Article 35 in RS) requires public consultations to be carried out through all phases of the EIA. Although not specified explicitly, this article may be interpreted that the public consultation is also required during the Prior environmental Assessment phase. The Ministry will decide whether a consultation is required. – It always decides it is necessary. B: Depending on the screening results, B is		The borrower is required to consult project-affected groups and local NGO's about the projects environmental aspects and take their views into account. Cat A: At least two consultations (1) at the scoping stage, shortly after environmental screening, and before the ToRs for the EA are finalized, and (2) once a draft EA report is prepared. Cat B: At least once during the EA process.

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
	re-categorized either as A or C and will thus inherit the requirements of these categories. C and D: Consultation is carried out once, during the Environmental Permit issuing procedure. Inter boundary impacts: In case of negative inter boundary (including inter-entity boundary) environmental impacts; the representatives and the public of the entity/foreign state have the right to participate in the consultation process.		
Disclosure	A and B (FBiH and RS): Prior to environmental Assessment Report (in FBiH)/Request for Decision (in RS) is disclosed prior to consultation (30 days allowed for comments). A and B (FBiH): For all A projects, and those B projects that require an EIA (following the PRIOR EIA), Entity Ministry sends a copy of the EIA study (may be interpreted as "draft EIA study" although not mentioned in the Law) to relevant authorities and other interested parties, allowing 30 days for receiving comments to the report. A and B (RS): For all A projects, and those	Environmental Assessment Report (draft) is disclosed prior to consultation (15-30 days allowed for comments). Public hearing process is obligatory. Participation of NGO and other groups is given.	Cat A: Borrower provides for the initial consultation a summary of the proposed project's objectives, description, and potential impacts. After draft EA report is prepared, the borrower provides a summary of the EA's conclusions. The borrower makes the draft EA report available at a public place (in local language). Cat B: Separate Cat B reports are to be made available to local NGOs and affected groups (local language).

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
	B projects that require an EIA (following the PRIOR EIA), Entity Ministry sends a copy of the draft EIA study to the project developer (since the Ministry contracts the preparation of the EIA study), relevant authorities and other interested parties, allowing 30 days for receiving comments to the report. C and D (FBiH & RS): Request for issuing an Environmental Permit (and relevant documents) must be accessible by the public, where 30 days are allowed for comments.		The disclosure process is complete only after the EA report is officially received by the Bank.
EA Review and Approval	A ,B and C (FBiH and RS): Entity ministries responsible for environmental issues review and approve the EIA reports and Environmental Permit requests. C and D: Cantonal Ministries (in FBiH)/Municipal authorities (in RS) review and approve Environmental Permit requests.	EIA Commission appointed by the Ministry organizes it. The number of commission members and its composition are determined depending on the intervention's environmental impact and environmental features in the intervention s impact area. Field visit by Commission is obligatory.	For Cat. A & B Projects, before formal clearance of environmental aspects of the project, the Bank reviews the results of the EA (especially consultations, EMP and institutional capacity), ensuring that the EA report is consistent with the ToR.
Licensing / permitting	New projects (FBiH): The following permits are required (each being a requirement for the next) for new projects: - Environmental Permit (for installations and facilities listed in	The Ministry provides a list of institutions authorized to prepare EIA.	None

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
	the proposed EA secondary legislation, A, B, C and D) - Physical Planning Permit (not required if detailed physical plans are available. Physical planning and technical conditions are prescribed by the relevant authority) - Building Permit - Usage permit Reconstruction/Rehabilitation projects (FBiH): The following permits are required (each being a requirement for the next) for reconstruction/rehabilitation projects: - Environmental Permit (for installations and facilities listed in the proposed EA secondary legislation an Environmental Permit is not required until 2008 if a conditioning plan exists for A, B, C, D) - Physical planning Permit (not required if detailed physical planning is available. Physical planning and technical conditions are prescribed by the relevant authority) - Building Permit - Usage permit		

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
	Note: Repair/rehabilitation of buildings and facilities destroyed during the war only require a construction permit and do not require urbanism and environmental permits. E projects (FBiH & RS): E projects do not require an Environmental Permit, however environmental aspects have to be included in the physical planning permit. The following permits are required (each being a requirement for the next). - Physical planning Permit (not required if detailed physical planning is available. Physical planning and technical conditions are prescribed by the relevant authority) - Building Permit - Usage permit During the issuing of environmental and physical planning permits for all categories, other permits may be required by the relevant entity, cantonal or municipal authorities issuing the permits (e.g. water use permit). RS: The permitting system in RS is similar but more flexible than in the FBiH where		

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
	the Environmental Permit is in some cases a condition for a physical planning permit and in other case it is a condition for a building permit. Similarly, the EIA, if the Ministry decides so, may also be a requirement for the building permit. Relevant ministries/authorities decide on the sequence of permits, i.e. when the Environmental Permit is a condition for other permits.		
Effluent standards / guidelines	The Environmental Permit contains the limit values for pollutant emissions. Emission limit values are to be taken from recently issued by-laws regulating actual emission limit values and guidelines. They are as follows: In FBiH: By-laws on Law on Air Protection 1. Regulation on Air Quality Monitoring, (OG of FBiH 12/05) 2. Regulation on Monitoring of Emission of Pollution Substances into Air (OG of FBiH 12/05) 3. Regulation on Air Quality Concentration Limit Values (OG of FBiH 12/05) 4. Regulation on VOC Emission (OG of FBiH 12/05)	The Environmental Permit contains the limit values for pollutant emissions.	Emission levels acceptable to the Bank are given in the PPAH

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
	5. Regulation on Conditions for Operations of Waste Incineration Plants (OG of FBiH 12/05) 6. Regulation on Emission Limit Values from Combustion Plants (OG of FBiH 12/05) 7. Regulation on Emission Limit Values (OG of FBiH 12/05) By-laws on Law on Waste Management 1. Regulation on Conditions for Transfer of Obligations from Producer and Seller Regarding Waste Management (OG of FBiH 09/05) 2. Regulation on Licensing Activities of Small Economy in Waste Management (OG of FBiH 09/05) 3. Regulation on Categories of Waste with Lists (OG of FBiH 09/05) 4. Regulation on Handling Waste from Hazardous Waste List or its content is unknown (OG of FBiH 09/05) 5. Regulation on Content of Plan for Adjustment of Waste Management for Existing Treatment Plants or Disposal Sites and Activities Done by Authorized Institutions (OG of		

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
	FBiH 09/05) In RS: By-laws on Law on Air Protection (OG of RS 39/05) 1. Regulation on Monitoring of Emission of Pollution Substances into Air 2. Decree on Emission Limit Values 3. Regulation on Air Quality Monitoring 4. Regulation on Air Quality Concentration Limit Values 5. Regulation on VOC Emission 6. Regulation on Conditions for Operations of Waste Incineration Plants 7. Regulation on Emission Limit Values from Combustion Plants By-laws on Law on Waste Management 1. Regulation on Content of Plan for Adjustment of Waste Management for existing treatment plants or disposal sites and activities done by authorized institutions **2.** Regulation on waste types and waste management activities which		

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
	require permit **3.** Regulation on categories of waste with lists 4. Regulation on waste categories, characteristics that make it hazardous, reuse of waste components and waste disposal		
Mitigation Plan	For A projects, mitigation measures are prescribed in the EIA study which are also included in the Environmental Permit. For other categories requiring an Environmental Permit, measures for protection of air, water, soil, flora and fauna and solid waste management measures are included in the permit itself. These measures can be considered as mitigation measures.	Measures for protection of air, water, soil, flora and fauna, solid waste are part of EIA. Mitigation measures have to be given for construction, operation and de-commissioning phase. These measures can be considered as mitigation measures.	Mitigation measures are included in the EMP. Obligation to carry out the EMP and additional conditions/measures under the EMP need to be included in the loan conditions. The EMP format is given in Annex II.
Monitoring Plan	The Ministry may require the preparation of the monitoring plan during preparation of EIA. Self-monitoring plan is included in the Environmental Permit for all categories that require an Environmental Permit (A, B, C, D). Besides self-monitoring, for categories that require an Environmental Permit, the environmental protection law states that, monitoring of installations and facilities by authorized institutions will be carried out every 3 years, in order to ensure that the	Monitoring plan is mandatory included in the EIA. Inspection is foreseen by regular practice.	Monitoring plan is included in the EMP.

Action	FBiH and RS Requirements	Croatia Requirements	World Bank Requirements
	requirements of the Environmental Permit (monitoring and other issues) are satisfied. Other environmental laws (e.g. law on air protection, law on water protection etc.) also specify the required monitoring procedures to be carried out by authorized institutions.		
Permits and Licensing during implementation	The Environmental Permit is reissued every 5 years or earlier if found necessary by the responsible Ministry (Art. 74 in FBiH and Art. 71 in RS).	Not given by EIA procedure.	None

Annex 3: Good Practice

Table 1: Examples of Good Practice for Upgrade and expansion of Municipal Wastewater Collection and Treatment System for the City of Konjic

Personnel	Premises and Equipment	Documentation	Quality Control	Operation

-Substantial number of quality human resources. -Defined responsibilities of the staff -Quality and continuous education of the staff being involved in tourism activities -Precise organizational scheme - Key staff - Concrete tasks for key personnel	-Premises to be located, designed, constructed in accordance with requests -Temperature, humidity and ventilation of toilet to be in accordance with its purpose -Laboratory has to be separated room with protected instruments -There are workshops for maintenance of parking and other facilities	-Documentation is essential part of quality assurance system - Design, creation, review and distribution of documents. -Upgrade and review of documents - Availability and archiving of documents - Written procedures during sampling and testing - Keeping records on all performed calibrations -Written procedures for usage of all instruments	-Sampling, specifications and testing -Separate sector for quality control - Hiring of external laboratories - Necessary pollution control systems - Operations have to comply with limits for discharge of wastewaters, local canalization and contaminated rainfalls into surface waters.	- Handling in accordance with procedures - Education of staff operating the plant

Table 2: Examples of Good Practice for Rehabilitation of Primary Wastewater Treatment Plant in Ljubuški

Personnel	**Premises and**	**Documentation**	**Quality Control**	**Operation**

	Equipment			
-Substantial number of quality human resources. -Defined responsibilities of the staff -Quality and continuous education of the staff being involved in tourism activities -Precise organizational scheme - Key staff - Concrete tasks for key personnel	-Premises to be located, designed, constructed in accordance with requests -Temperature, humidity and ventilation of toilet to be in accordance with its purpose -Laboratory has to be separated room with protected instruments -There are workshops for maintenance of parking and other facilities	-Documentation is essential part of quality assurance system - Design, creation, review and distribution of documents. -Upgrade and review of documents - Availability and archiving of documents - Written procedures during sampling and testing - Keeping records on all performed calibrations -Written procedures for usage of all instruments	-Sampling, specifications and testing -Separate sector for quality control - Hiring of external laboratories - Necessary pollution control systems - Operations have to comply with limits for discharge of wastewaters, local canalization and contaminated rainfalls into surface waters.	- Handling in accordance with procedures - Education of staff operating the plant

Table 3: Examples of Good Practice for Wastewater Treatment Plants in Trebinje, Nevesinje and Bileća

Personnel	Premises and Equipment	Documentation	Quality Control	Operation
-Substantial number of quality human resources. -Defined responsibilities of the staff -Quality and continuous education of the staff being involved in tourism activities -Precise organizational scheme - Key staff - Concrete tasks for key personnel	-Premises to be located, designed, constructed in accordance with requests -Temperature, humidity and ventilation of toilet to be in accordance with its purpose -Laboratory has to be separated room with protected instruments -There are workshops for maintenance of parking and other facilities	-Documentation is essential part of quality assurance system - Design, creation, review and distribution of documents. -Upgrade and review of documents - Availability and archiving of documents - Written procedures during sampling and testing - Keeping records on all performed calibrations -Written procedures for usage of all instruments	-Sampling, specifications and testing -Separate sector for quality control - Hiring of external laboratories - Necessary pollution control systems - Operations have to comply with limits for discharge of wastewaters, local canalization and contaminated rainfalls into surface waters.	- Handling in accordance with procedures - Education of staff operating the plant

Annex 4: Projects in BiH and Croatia financed by the World Bank

Country	Financed by	Project name	Focal Area	Project stage	Project cost ($ million)
BiH	WB	Solid Waste Management Project	Water sanitation and flood protection; Law and justice and public administration	Active	21.0
BiH	WB	Solid Waste Management Supplemental Project	Water sanitation and flood protection; Law and justice and public administration	Active	9.3
BiH	WB	Urban Infrastructure & Service Delivery Project	Water sanitation and flood protection; Law and justice and	Active	22.5

			public administration		
BiH	WB	Forest Development & Conservation Project	Agriculture, fishing and forestry	Active	5.09
BiH	WB	Small-Scale Commercial Agriculture Development Project	Agriculture, fishing and forestry; Industry and trade	Active	14.13
BiH	WB	Cultural Heritage Pilot Project	Law and justice and public administration; Health and other social services	Closed	15.8
BiH	WB	Mostar Water Supply & Sanitation Project	Water sanitation and flood protection	Closed	13.38
BiH	WB	Local Development Pilot Project	Water sanitation and flood protection; Transportation; Energy and mining; Law and justice and public administration	Closed	18.5

BiH	WB	Forestry Project	Agriculture, fishing and forestry; Law and justice and public administration	Closed	20.2
BiH	WB	Water, Sanitation and Solid Waste Urgent Works Project	Water sanitation and flood protection	Closed	70.0
HR	WB	Coastal Cities Pollution Control Project	Water sanitation and flood protection; Law and justice and public administration	Active	95.05
HR	WB	Agric Acquis Cohesion (Crl)	Agriculture, fishing and forestry	Pipeline	40.0
HR	WB	Municipal Environmental Infrastructure	Water sanitation and flood protection	Active	145.4
HR	WB	Coastal Forest Reconstruction And Protection Project	Law and justice and public administration; Agriculture, fishing and forestry	Closed	67.3

Annex 5: Policy, legal and administrative framework

The World Bank has established policies for environmental screening and assessment of loan projects. All activities financed by the Bank have to be in compliance with local environmental rules and regulations, as well as with environmental policies of the Bank[11]. Since the World Bank will finance selected projects and activities, through the GEF found, environmental policies of the World Bank, as well as of Croatia and Bosnia and Herzegovina will have to be taken into account. This is an international project. It is not related only to the two implementing countries but Serbia and Montenegro, as well.

During the initial stage of this report, it has been established that the WB policies and that of the two implementing countries are in compliance. See annex 7 for details

[11] IMPORTANT: activities financed by the Bank have to be completely in compliance with local environmental rules and regulations if national rules and regulation are higher as than the Bank.

World Bank is present at the Project area long time. According to that, all activities, funded by the WB are regulated thru environmental policies of the World Bank, as well as Croatian and Bosnia and Herzegovina legal frame work. See Annex 5 for list of projects.

1. World Bank

The World Bank has established policies for environmental screening and assessment of projects. All activities financed by the Bank have to be in compliance with local environmental rules and regulations, as well as with the environmental policies of the Bank. The Bank requires environmental screening and, when warranted, environmental assessment of activities proposed for Bank financing to help ensure that they are environmentally sound and sustainable. The environmental assessment runs concurrently with the design activities and implementation process. Its type and particularities depend on nature, scope, and any potential environmental risks.

The Bank undertakes environmental screening of each proposed project to determine the appropriate EA scope and type. The Bank classifies the proposed project into one of the four categories, depending on the type, location, sensitivity, and scope of the project and the nature and magnitude of its potential environmental impacts.

- Cat A: A proposed project is classified as Cat A if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subject to physical works. For a Cat A project, the borrower is responsible for preparing a report, normally an EIA.
- Cat B: A proposed project is classified as Cat B if its potential adverse environmental impacts are less adverse than those of Cat A projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigate measures can be designed more readily than for Cat A projects. The scope of EA for a Cat B project may vary from project to project, but it is narrower than that of Cat A EA.
- Cat C: A proposed project is classified as Cat C if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Cat C project.

Furthermore, the World Bank's exclusion list forbids financing of certain activities and projects. Several items on the exclusion list are directly related to environmental protection:

- Production or activities involving harmful or exploitative forms of forced labour/harmful child labour.
- Production or trade in any product or activity deemed illegal under host country laws or regulations or international conventions and agreements.
- Production or trade in weapons and ammunitions.

- Production or trade in alcoholic beverages (excluding beer and wine).
- Production or trade in tobacco.
- Gambling, casinos and equivalent enterprises.
- Trade in wildlife or wildlife products regulated under CITES.
- Production or trade in radioactive materials.
- Production or trade in or use of unbounded asbestos fibbers.
- Commercial logging operations or the purchase of logging equipment for use in primary tropical moist forest (prohibited by the Forestry policy).
- Production or trade in products containing PCBs.
- Production or trade in pharmaceuticals subject to international phase outs or bans.
- Production or trade in pesticides/herbicides subject to international phase outs or bans.
- Production or trade in ozone depleting substances subject to international phase out.
- Drift net fishing in the marine environment using nets in excess of 2.5 km in length.

Both beneficiary countries have an obligation of performing EIA included in Regulations to Law on Environmental Protection, but those obligations are dependant on size and capacities of certain plant and facilities. As for screening requirements, the situation is similar both in BiH and Croatia. The screening is not always obligatory, it rather depends on the EIA request.

Environmental politics and main EA procedures of both countries involved in the project mostly comply with World Bank requirements (at least for B and C Category projects).

However, there are gaps, especially concerning the screening and identification of EMP in both countries.

It is possible to overcome these gaps and harmonise procedures by preparing environmental guidelines that will be included in the project Operations Manual. The purpose of the guidelines is to provide instructions to the beneficiaries on the analyses of projects submitted to the grants program.

There are no proposed sub-projects falling into category "A", however, in case of any, they would be EXCLUDED from financing by the Project.

Comparison of World Bank requirements with BiH and Croatia requirements is given in Annex 1 to this Report.

2. Bosnia and Herzegovina

Environmental responsibilities under international conventions are a responsibility of the State via the Council of Ministers, and are co-ordinated by the Ministry of Foreign Affairs and Economic Relations or the Ministry of Euro Preliminary EIAn Integration.

Environmental issues within BiH are in the jurisdiction of each of the two entities, FBiH and RS, as well as Brcko District. In the FBiH environmental jurisdiction is even more complex, because the fundamental responsibility for the environmental issues is on the Canton level – there are 10 Cantons in FBiH. RS is not administratively organized on a regional level, only on an Entity and local level. The legal framework for efficient environmental management and protection was based on the constitutional right of citizens to a healthy environment, and also on international principles in this field.
New environmental legislation is based on the EC Directives.

A set of five new Environmental Laws was developed in 2000/2001 and now form the basis for future environmental management in the country. Regulations to Law on Air Protection and Law on Waste Management were passed to enact these laws, and this was done within each entity.

There is no State Agency that could co-ordinate environmental issues for the country at present (although there are plans to establish a National Environmental Protection Agency (NEPA) at the current time). An Environmental Steering Committee (ESC) has been in operation since 1998 to assist in co-operative work between the two entities and the co-ordination of environmental activities. Work of ESC seems to be very efficient, even without the needed legal responsibility. Funding for ECS activities were ensured until now by different donors and it is anticipated that additional funding will be given to extend its activities.

The new entity laws on environmental protection regulate the area of environmental assessment and the Environmental Permit procedure. These two entity laws are almost identical, and were prepared in accordance with environmental policies of the Euro Preliminary EIAn Union and international conventions. Permits required by other laws (e.g. waste management permit from the Law on Waste Management, water management permit from the law on water protection) as well as other necessary permits (forestry, agriculture, etc.) are part of the integrated Environmental Permit. During preparation and implementation of subprojects, other relevant laws will also need to be reviewed for specific requirements; Law on Concessions, Law on Construction Land, Law on Physical Planning; and Law on Construction.

A key requirement of the Law on Environmental Protection, the by-law regulating the EIA and Environmental Permit procedure was adopted in April 2004. in FBiH (Official Gazette of FBiH 19/04)

The by-law regulates:

- Installations and facilities[12], or significant modifications in existing plants and processes, for which the Entity Ministry (Ministry of Physical Planning and Environment in FBiH and Ministry of Urbanism, Civil Engineering and Ecology in RS) responsible for environment requires an EIA within the environmental permitting procedure - *A* [13].
- Installations and facilities, or significant modifications in existing plants and processes, for which the Entity Ministry responsible for environment shall decide whether an EIA is required during the Environmental Permitting procedure - B.
- Installations and facilities which do not require an EIA, and which can be constructed and start operating only if they have obtained an Environmental Permit from the Entity Ministry responsible for environment - C.
- Installations and facilities which do not require an EIA, and which can be constructed and start operating only if they have obtained an Environmental Permit from the Cantonal Ministry responsible for environment in FBiH/Municipality in RS - D.
- Content of the EIA Report.
- Criteria for Environmental Screening.

Identical by-law is being prepared in RS (Chapter IX in RS Law on Environmental Protection is devoted to EIA. Article 62 establishes the objectives of EIA, meaning to: "the identification, description and assessment – in an appropriate manner and in the light of each individual case of direct and indirect effects of a project on the following elements and factors: human beings, fauna and flora; soil, water, air, climate and the landscape; material assets and the cultural heritage; the interaction between the factors mentioned above". Article 63 mandates a project/activity proponent to attach the approved EIA to his application for "a construction permit or urban consent in cases when the construction permit is not required").

2.1. Legislation concerning EA for selected Project activities

- WWTP in Federation of Bosnia and Herzegovina

According to Environmental Permit issuing in FBIH defined by Environmental Law (OG 19/04) and amended by '"Regulation on Plants and Facilities for which EIA is mandatory and plants and facilities that may be built and put in operations", EIA is mandatory only for plants for the WWT of capacity more than 50.000 EBS. Consequently, this plant does not require issuing of Environmental permit on Federal level and there is no Regulation on environmental permits in the Herzegovina-Neretva Canton.

[12] "Projects" in RS.

[13] This categorzation and numbering method does not exist in the by-law. It is used in this document for easier comparison and reference.

It is necessary to calculate equivalent population number every two year. This would be included in water management permit issued by the Ministry of Agriculture, Water Management and Forestry.

Even though environmental permit is not required by Federation regulations, it would be necessary to involve public in this process in terms of organization of public hearing for population and all stakeholders.

- WWTP IN Republika Srpska

Regulation on EIA in Republika Srpska has not been enacted yet. It is expected, however that the Regulation on EIA procedure and contents will enter into force by the end of 2005, since they have been passed by the Parliament of Republic of Srpska this November. The EIA requirements of both Bosnia and Herzegovina's entities are therefore identical, with consideration only of differences in constitutional arrangement and administrative setting of each Entity. Therefore, it is not expected that creation of EIA will be needed for this plant.

Even though national (entity) legislation does not require EIA, it is strongly recommended to perform it before issuing any Permits (Location, construction etc.).

Even though national (entity) legislation does not require the EIA development, it is strongly recommended to make it before issuing any Permits (Location, construction etc.).

3. Croatia

Environment protection is traditionally divided between different administrative bodies (sectors, directorates) with separate authorities, which often prevent integral/sustainable approach to environment protection even between themselves. It refers, before all, to water related problems (that has always been an autonomous administrative unit), nature, environment, physical planning, soil, forests.

After the last Governmental reorganization, several changes occurred in the organizational structures and competencies/responsibilities of the state environmental institutions. The former Ministry of Environmental Protection and Physical Planning (MEPPP) was reorganized into Ministry of Environmental Protection, Physical Planning and Construction (MEPPPC). The new competencies
of MEPPPC do not cover nature protection. The Nature Protection Division was transferred to the Ministry of Culture Affairs.

The former State Water Directorate was transferred to the Ministry of Agriculture, Forestry and Water Management as a new division. The mandate of the former state directorate has remained unchanged.

Responsibility for Industrial Pollution Control and Risk Management is shared between the Ministry of Economy, Labor and Entrepreneurship, Ministry of Agriculture, Forestry and Water Management and MEPPPC.

Responsibility for Chemicals and GMO's is shared between the Ministry of Economy, Labor and Entrepreneurship, Ministry of Interior, Ministry of Health and Social Affairs, Ministry of Culture Affairs, MEPPPCE and Ministry of Agriculture, Forestry and Water Management.

Responsibility for Nuclear Safety and Protection against Radiation is shared between Ministry of Health and Social Affairs and Ministry of Economy, Labor and Entrepreneurship.

The Government strengthened the environmental institutional capacity via three new bodies:

Environment Protection Agency was established in 2002. Its main task is environmental data management.

Fund for Environment Protection and Energy Efficiency was established in January 2004, mandated to finance preparation, implementation and development of programs, projects and similar activities in the sector for preservation, sustainable use, protection and improvement of environment.

State Institute for Nature Protection was established in 2003 as a state body responsible for implementation of nature protection policy and providing adequate technical expertise primarily for the Nature Protection Division within the Ministry of Culture Affairs, MEPPPC and Ministry of See, Tourism, Transport and Development.

The MEPPC is authorized to issue location and building permits and oversee environment impact assessment procedures.

Some authorities (importance from the standpoint of this project) have been transferred to the regional level to county offices, while others have been transferred to the local government and self-government level. For example in compliance with the Law on Waste, local self- government is responsible for municipal waste management (organization, collection, disposal, financing) while counties are responsible for industrial waste disposal. The management of hazardous waste has been raised to the state level.

In Croatia, one additional safeguard mechanism closely related to the environment has existed for years i.e. the obligation that the location of any plant has to be approved by Physical plan and the location of the plant must be marked in physical plans. This concerns urban areas, where physical plans are obligatory and detailed, but this can be required also for rural areas. At a minimum, in County and/or City Physical Plans, general recommendations and limitations regarding the environmental impact for development of rural areas and business activities are given. According to the law, County and/or municipalities can set much stronger environmental standards than the national law.

3.1. Legislation concerning EA for selected Project activities

According to the Ploče master plan, the Baćina lakes are designated as the recreational and tourism area. The regulation on EIA (Official Gazette of Croatia No. 59/00) to Law on Environmental Protection does not require the EIA study for construction works in designated areas, only in Nature and National Parks. The new Regulation Plan of Ploče has still not been enacted and it is possible that Baćina Lakes will be proclaimed the Park of Nature. In that case, it will be necessary to make an EIA in accordance with Croatian legislation.

Annex 6: Record of Public Consultations

1. Introduction

During preparation of this Study, along with the existing Technical studies, the Consultant has contacted local authorized institutions in order to get more information on performance of the proposed Project activities.

List of contacted people and their responses are given in the Table 1 below.

Table 1: List of contacted people and their responses

Project activity	Contacted person(s)	Response given
Rehabilitation of the Primary Wastewater Treatment Plant in Ljubuški	Mr. Blago Brkić, Director, Communal Company Ljubuški; Mr. Zlatko Grizelj,	In accordance with their response, Mitigation plan for this activity was made. They

	Chief Engineer, Communal Company	were very cooperative and gave the best proposal that we have described. Mr. Grizelj has sent us presentation of entire facility for treatment of wastewaters. The best, fastest and the simplest solution for wastewater treatment is to replace braced girder in primary pool. Braced girder is very large, with 2,5 cm diameter of holes, which is too large for this purpose and allows larger particles of pollution to come trough it. All things listed above cause very fast soil and plugging of pores. Replacement of that braced girder (with one that has of 2,5 mm diameter holes) would solve everything. There is an ideal solution as well: during replacement of braced girder, incoming water to be discharged into the channel for emergency situations.

		There is enough space for broadening of the channel if needed, or using it just as an additional option.
Wastewater Treatment Plant for the facilities within Hutovo Blato Nature Park	Mr. Nikola Zovko, Director, Nature Park; Mr. Marinko Dalmatin, Chairman, NGO "Lijepa naša"	Mr. Dalmatin was director of the Nature Park before the war. He is informed about the proposed project and gave some suggestion. Existing bio-desk is ruined. He doubts that it could be repaired and suggests the use of plastic containers (sewage tank). There is no link between dairy and other objects. Dairy should solve its problem with WW. Current situation is terrible and worrying.
Improved tourism infrastructure in Vjetrenica cave	Mr. Andrija Lučić, Tourist Bureau of Vjetrenica	He is not informed about any activities near Vjetrenica cave. There are many options, but none has been implemented so far. Everything is devastated, he feels embarrassed when tourists visit. His family finances all costs. He is very

		interested in any further cooperation.
Development of an eco-trail with information center at Baćina lakes	Mr. Andrija Milić, Director, Tourism Community Baćina Mr. Jakić, Chairman, City Government	They have no information of any Project or any activities planned to be done at this location and ask us to give him all the information we have about it. The only person that might know something about it was Mr. Mišetić, project manager of Elektroprojekt, but he was not available at the time.
Continuation of Construction of Municipal Wastewater Collector for the City of Konjic	Mr. Esad Omerović, Assistant Minister for Physical Planning and Environment, Konjic Municipality; Mr. Dženamir Hasagić, Engineer, Vodovod Konjic	ToR sent in Bosnian language to Mr. Petar Begović. Part of ToR included in Baseline Data

2. Reports from workshops on project activities mainly dealing with wastewater treatments and land use

During 2005, several workshops were held with the aim to inform stakeholders about the project and seek for their opinions and suggestions, as well as approvals for implementation of project activities.

First workshop of regional GEF project "Integrated Ecosystem Management of Neretva and Trebišnjica River Basin (NTRB)" was held on 02.12.2004. Participation in workshop was accepted by large number of participants from almost all relevant institutions in area of environmental protection and natural resources management, both from BiH and Croatia.

Participants were divided into four groups. Each group consisted of participants from different sectors and areas. Each group made log-frame matrix for identification of problems in area and their causes and propose measures to be taken and activities on the basis of that analysis.

Objection of NTRB GEF project was to contribute to environmentally sound management of Neretva and Trebišnjica River Basin ecosystem. Main task of the workshop was to gather all relevant experts and authorized institutional bodies so that they could assist in preparation of project documentation.

Mr. Ramiz Mehmedagić, Minister of Spatial Planning and Environmental Protection and Mr. Zdravko Begović, Assistant Minister for Ecology in Ministry for Spatial Planning, Construction and Ecology of RS addressed participants stressing the support of authorized entity ministries in NTRB GEF project realization. This was the first informal meeting of Technical Working Group for project realization that will actively involve all authorized institutions from BiH and Croatia in project realization.

Workshop has presented current activities being realized on the project. Approval of grant in amount of 8 million US $ (6 BiH, 2 HR) should launch realization of planned designed activities in duration of next five years.

It is important to identify main problems in the phase of preparation of project documentation, as well as to mark their causes and to give suggestions for activities for their removal. Participants agreed that priority was to focus on problematic of legal and administrative framework and to assure more efficient co-operation within sectors. Solving this issue would significantly facilitate implementation of NTRB GEF Project.

Methodology that would be applied in order to solve complex problematic of integrated ecosystem management in the basin was proposed. Some basic principles were given:

1 Monitoring of state and information system
2 Exact definition of current state
3 Detection of cause for current state
4 Determination of priorities by sectors

5 Rising awareness and public participation

All persons and institutions involved in project activities have to efficiently co-operate between themselves. Following issues were discussed as well:

1 Plan and legal basis
2 Non harmonization of jurisdictions
3 Integrated basin management
4 Lack of international co-operation
5 Inadequate valorisation of main resources
6 Protection and management of natural areas
7 Monitoring and data exchange
8 Insufficient and inadequate public involvement
9 Water supply in basins
10 Non existence of data base
11 Disconnection of hydro power systems
12 Alerting system
13 Waste waters
14 Landfills
15 Impact of TPPs on air and land
16 Exploitation of gravel for rivers
17 Priorities for resources protection
18 Criteria of sustainable economic development
19 Pollution of waters with hazardous substances
20 Modified working regime of HPP

Some specific and general suggestions were given. Need for the following issues was stressed:

1 Redefining of legislation concerning water and land resources.
2 Redefinition of water supply conditions.
3 Definition of accumulations upstream from Konjic

4 Necessity of harmonizing priorities on relation biodiversity – humans
5 Determine strategy of relation between development and environmental protection
6 Co-operation of key institutions as a precondition for successful accomplishment of this project
7 Pay attention to efficient co-ordination during realization of project activities. Co-ordination between Interstate commission, Steering Committee and Technical working group is extremely important.

Table 2: Workshop participants

Name of participant	Institution
Aida Hrnjica	Bosna-S Co. - Sarajevo
Aleksandar Bjelica	PAP/RAC
Amra Krajina	Ministry of spatial planning and environmental protection, FBiH
Dragan Milošević	HPPs on Trebišnjica
Duško Vujović	HPPs on Trebišnjica
Hellen Russell	Golder Associates
Majda Hadžimuratović	Bosna-S Co. - Sarajevo
Miroslav Steinbauer	Croatian Waters
Tarik Kupusović	Hydro-Engineering Institute of Civil Engineering Faculty Sarajevo
Zoran Mateljak	REC BiH
Ante Šprlje	Dubrovnik-Neretva County
Marinko Dalmatin	Ecological association "Lijepa naša", Čapljina
Mehmed Sarić	University "Džemal Bijedić", Mostar – Civil Engineering Faculty
Mirjana Švonja	Croatian Waters, Split
Srećko Galić	Ministry of constructing, spatial planning and environmental protection of Herzegovina Neretva

	County
Adnan Hodžić	Bosna-S Co. – Sarajevo
Ante Šprlje	Dubrovnik-Neretva County
Branislav Miković	Municipality of Nevesinje
Branka Martinović-Vuković	Dubrovnik-Neretva County
Božo Vukoje	Regional Agency for Economic Development "Redah"
Ljubica Mirković (Dušanka Nosović)	Municipality of Bileća
Esma Kreso	Bosna-S Co. – Sarajevo
Hasan Zulić	Program od River Una Basin development
Irena Bakalar-Bulum	Municipality of Čapljina
Karmen Cerar	Ministry of Agriculture, Forestry and Water Management of Croatia
Ljubica Mirković	Municipality of Bileća
Marinko Kordić	Federal Meteorological Institute
Mirko Hadžić	HPPs on Trebišnjica
Neđo Prljeta	"Urbing" Mostar
Sead Pintul	City Administration, Mostar
Slobodan Šaraba	Institute for constructing-business centre Trebinje
Srećko Vučina	Elektroprivreda HZ HB
Stjepan Matić	«Nature Park Hutovo Blato»
Zoran Milašinović	Civil Engineering Faculty, Sarajevo
Azra Tabaković	Bosna-S Co. – Sarajevo
Borislav Vukoje	Water Resource Management Company, Bileća
Esad Dukanović	Embassy of Spain, Sarajevo
Marinko Dalmatin	Ecological Association «Lijepa Naša» Čapljina
Mirjana Menalo	Municipality of Čapljina

Mirko Šarac	«Water Region of Adriatic Sea Basin» Mostar
Nada Galić	Ministry of Agriculture, Forestry and Water Management of FBiH
Sabiha Zahirović	HPPs on Neretva, Jablanica
Sanja Jelavić	Elektroprivreda HZ HB
Vojislava Dragičević	Municipality of Berkovići
Zdenko Mandić	Ministry of spatial planning, resources and environmental protection of Western Herzegovina County

2.1. Conclusion

Workshop was closed summarizing the results of work by representatives of expert team that are involved in activities of preparation of project documentation with reactions of workshop participants.

Mr. Roko Andričević, representative of PAP/RAC from Split gave a closing word. It was stressed that workshop was successful in terms of number and type of participants from different levels and sectors. Product of this project phase will be proposal of feasible project activities that can be financially incorporated into project budget.

All workshop participants were told that their active participation concerning definition of project activities is expected.

Final decision on project activities to be implemented during NTRB Project will be made from bodies on state levels and in co-operation with all stakeholders.

The second workshop of the Land and Water Resource Assessment of the Neretva and Trebišnjica River Basin (NTRB) was held together with the National Conference for the Social Assessment Study. This was done, as most of the stakeholders for both of the study components are the most of the same people, and in order to decrease redundancies and repetition, the plenary sessions were held together, while the actual group work was split according to the two study components.

The aim of the second workshop of the L&W Study was to inform the stakeholders on developments made within the preparation of "L&W" study input into the full GEF project design. The workshop was also formulated with the major emphasis being stakeholder involvement and participation, assuming that the local and other stakeholders would provide best comments and input.

The national workshop for the Social Assessment was designed to understand how people use land and water in the NTRB, to identify sites of significance (cultural, historical and environmental) and to identify what communities can do for themselves in these areas and what support they need to do it.

Most of important stakeholders within the sectors of water, land and environment in the NTRB have been involved in development of GEF project documentation. After the first "L&W" workshop, which was held in December 2004, the consultant was provided with participatory input from involved stakeholders on identification of main issues in sectors of interest in the NTRB. As a result of the first workshop a log-frame matrix has been developed. In the following period, and relying on information provided with the log-frame, a list of possible activities related to "L&W" has been proposed. Proposed activities have been gathered into eight "L&W" projects and at the second workshop presented to the stakeholders in a form of a list of projects.

Following the opening greetings and information provided by chairman Mr. Goran Krstović, the participants were greeted first by Mr. Ramiz Mehmedagić, Minister of Physical Planning and Environment of Federation BiH, and then by Mr. Reuf Hadžibegić, assistant Minister for Energy, within the Ministry of Foreign Trade and Economic Relations of BiH.

Mr. Mehmedagić has expressed his satisfaction with the work done so far, and with the organization of this second workshop. He stressed the importance of this workshop, where the participants and stakeholders would be introduced to progress made within this project since the first workshop held in Hutovo Blato. He proceeded to discuss the deadline in June, with an emphasis on the gravity of the work and tasks ahead, which need to be completed by June.

Mr. Hadžibegić opened his statement with gratitude for participating at such an important meeting. Water resources are one of the greatest development assets of BiH, which require further work, in close cooperation with Croatia, not only in the NTRB, but also the Sava, that is Danube basin. Within this project a Steering Committee and the Technical Working Group have been formed, which shall further develop this project with the assistance of the World Bank, in cooperation with Croatia.

3. Bileća – Meeting of stakeholders

Table 3: List of participants of meeting held in Bileća

No.	Name of participant	Institution
1.	Nosović Dušanka	Mayor for urbanism, Municipality of Bileća
2.	Samardžić Miladin	Assistant to Mayor of Municipality Bileća
3.	Šarenac Vaso	Mayor of Municipality Bileća
4.	Radmilović Radoslav	President of Assembly Bileća
5.	Bjelica Željko	Vice-president of Assembly Bileća
6.	Radovanović Milivoje	Acting Mayor for Economy
7.	Kešeljević Blagoje	Higher expert associate for economy
8.	Tabaković Nedjo	Acting Mayor for Finances
9.	Milićević Zoran	Youth representative
10.	Inić Slavojka	Sanitary inspector
11.	Greda Verica	Water-agriculture inspector
12.	Bjelica Savo	Expert for urbanism of Municipality of Bileća
13.	Denda Simo	Communal inspector
14.	Nosović Nedjo	Construction inspector
15.	Batinić Obrad	Fishermen representative
16.	Vukoje Borislav	Director of Water management

		company Bileća
17.	Milošević Dragan	Water management company representative
18.	Bjelović Dragan	Representative of Communal company
19.	Mitrić Nataša	Representative of Commission for development
20.	Uljarević Radislav	Representative of local radio
21.	Lero Nenad	Representative of private sector
22.	Rogan Rajko	Director of „Bilećanka"
23.	Bekan Stevan	Municipality of Trebinje
24.	Kokolj Mladen	Elementary school Sveti Sava
25.	Vučković Obrad	Assembly of Bileća Municipality
26.	Šakotić Slobodan	NGO Trebinje
27.	Toholj Dušan	NGO Trebinje
28.	Milijana Kovač	Service for environmental protection, Municipality of Nikšić, Montenegro
29.	Olivera Božović	Water management and plumbing company Nikšić, Montenegro
30.	Dražen Čepanovič	Water management and plumbing company Nikšić, Montenegro
31.	Zoran Šabanović	Water management and plumbing company Nikšić, Montenegro
32.	Željko Nikolić	Municipality of Nikšić
33.	Branka Vujović	Elektroprivreda of Montenegro, Nikšić
34.	Tanja Stamenković	Water management and plumbing

		company Nikšić, Montenegro
35.	Jelena Mašulović	Assembly of Nikšić Municipality
36.	Vera Mirković	Assembly of Nikšić Municipality
37.	Milenija Eraković Karadžić	Assembly of Nikšić Municipality
38.	Boro Vuković	Assembly of Nikšić Municipality
39.	Branko Radojčić	University of Nikšić
40.	Luka Mitrović	HMZ of Montenegro
41.	Dragomir Brnjoš	Co-ordinator for preparation of Feasibility Study
42.	Zdravko Mrkonja	Expert for technical and water quality issues
43.	Rade Ivanković	Expert for financial and economy analyses
44.	Mira Purić	REC Montenegro
45.	Zoran Mateljak	REC Bosnia and Herzegovina

Creation of conceptual design for «Project of water resources quality in Municipality of Bileća» is related to services concerning Project «Transboundary Cooperation through Environmental Planning and Investment» financed by Holland Ministry of Foreign Affairs and implemented by REC for Middle and Eastern Europe.

General objective of the Project is to improve contacts and transboundary co-operation and to stress key needs for investments regarding environment in four countries of SEE region (Albania, Bosnia and Herzegovina, FYROM and Serbia and Montenegro).

Project consists of several main tasks consisting of four phases:

I. Initial project phase – already implemented with results in identification of three priority problems in environmental protection in the region.

II. Project identification and formulation – REC will assist stakeholders from municipalities Bileća, Nikšić and Herceg Novi in mutual work, in order to mutually analyse problems concerning shared water resources to develop project strategy and tasks necessary to solve

problems. This phase started with workshop and meeting of all stakeholders (Bileća, Trebinje, Nikšić and Herceg Novi) held in October 2005. Workshop was a combination capacity building/training to inform key community stakeholders (local authorities, public institutions) about project management concepts and approach to log-frame matrix, to enable them to use those in future definition of environmental problems – unsustainable usage and intensive pollution of water resources.

III. Preparation and development of Project

IV. Communication with sources of financing and data distribution

3.1. Conclusions /Recommendations

In order to protect water of Bileća Lake from deterioration that may occur in the future and endanger health of inhabitants. It is necessary to perform following activities, in three phases:

I Phase - priority

2 Construction of wastewater treatment plant in Bileća.

3 Reconstruction of old and construction of new sewerage network in Bileća and connection of all inappropriate discharge systems to this sewerage network.

II Phase

6 Rehabilitation of water network in Bileća

III Phase*:*

7 Construction or expansion of sedimentation tank and extension of surface of filter fields for complete treatment of drinking water. Possible introduction of ionisation during disinfections.

It is necessary to introduce complete monitoring of Bileća lake waters.

After final definition of scope and type of project activities, project documentation consisting of description of project activities and affiliated EMPs for public access was delivered to Municipalities.

Public access lasted for 30 days. It was led by Municipal Mayor or Chief of urbanism sector within Municipality.

After completion of public access procedure, Municipalities supported consultant in organising Public Consultations. Records from recently held Public Consultations are given below.

4. Konjic

4.1. First Public Consultations

Public consultations in Konjic were held within the Second Forum for LEAP for Konjic municipality preparation. Forum was held on 28.02.2006. There were 15 participants, representatives of all structures important for LEAP and general environmental decision making. Project activity presentation and discussion were very useful and great interest of Local community representatives in solving environmental problems, primarily infrastructure ones, was shown.

The need was shown for determination of priorities that could be realised through support of GEF and WB. One of selected priorities was construction of wastewater treatment. This is the priority problem to be solved in a due time, as agreed by citizens and representatives of authorities.

Table 4: List of participants in Konjic

No.	Name of participant	Institution	Position
1.	Dragan Agić	Municipality of Konjic	Local LEAP co-ordinator
2.	Azra Gackić	Federal Ministry of Spatial planning and environmental protection	Federal environmental inspector
3.	Suad Hajrić	REC	Project manager
4.	Nesib Mutapčija	Cantonal Ministry for Economy Konjic	Director of forest directorate
5.	Enver Tahirović	JKP Standard	Director

6.	Senka Draganić	NGO «Zeleni Neretva»	Co-ordinator
7.	Suad Špago	Water Management Company Konjic	Director
8.	Izet Ćanović	Energetika d.d. Konjic	Director
9.	Dženamir Hasagić	Water Management Company Konjic	Technical Director
10.	Esad Omerović	Municipality of Konjic	Assistant to Mayor of Konjic Municipality
11.	Afan Hajduk	NGO for Herzegovina	
12.	Sabit Špago	Municipality of Konjic	Councilmen in Municipal Council of Konjic
13.	Almedin Begić	Government of Herzegovina-Neretva Canton, Ministry of Economy	Expert advisor
14	Andrea Marković	Dvokut pro Sarajevo	Expert

4.2. Additional Public Consultations

Additional public consultations were held in Konjic on 19.07.2006. Project of wastewater treatments for municipal wastewaters and two metallurgy companies were presented to participants, after which discussion followed. List of participants is showed in the table 5 below.

Table 5: List of participants in Konjic public consultations

GEF Projekat upravljanja rječnim slivovima Neretve i Trebišnjice

Javna rasprava – Konjic, 19.07.2006.

Redni broj	Ime i Prezime	Institucija	Kontakt (e-mail, br.telefona)	Potpis
1.	Alija Zaradžić	Općina Konjic	726 160	[signature]
2.	Tahirović Enver	JKP "STANDARD"	036/726-308 jkpstandard@bih.net.ba	[signature]
3.	TALOVIĆ SAMIRA	UNIS GAL	061 140-351	[signature]
4.	Golubić Suad	Switec-Europaj	729-180 061/346-972	[signature]
5.	Perva Feud	Predsjednik MZ Jasenik	746011 061/910-134	[signature]
6.	Helidović Alija	MZ BJELA	061/723-040	[signature]
7.	HEBIBOVIĆ EMIN	PREDSJEDNIK MZ GLAVATIČEVO DIREKTOR "VRUTAK" D.O.O.	061/726-036 e-mail, VRUTAK@BIH.NET.BA	[signature]
8.	Čemić Sadik	MZ-e Grabovci	747-734 730-930	[signature]
9.	MUJKIĆ VAHID	MZ LISIČIĆI	061-346-208	[signature]
10.	DERVIŠ [illegible]	OPĆINA KONJIC	061/212-443	[signature]
11.	RIDIC SUAD	MZ Stari Grad Konjic	735-360	[signature]

12.	Bilanović Kemo	Predsjednik MZ. Centar	928-067	[illegible]
13.	[illegible]	[illegible] - [illegible]	061 227-646	[illegible]
14.	DŽENAMIR HASAGIĆ	„VIK" - KONJIC	dzenamir@hotmail.com 061 760 556	[illegible]
15.	ESAD OMEROVIĆ	OPĆINA KONJIC	061/196-764	[illegible]
16.	DŽEVAD BOLOBAN	MZ ČELEBIĆI	064-154-087	[illegible]
17.	Ibro [illegible]	MZ Čelebići	721-281	[illegible]
18.	Hadžizulić Živan	Ovčiječe	726-153	[illegible]
19.	Aleksandar Kutić	CETCOR	061 202025	[illegible]
20.	Andrea Marković	DVOKUT, Sarajevo	061/225-104	[illegible]
21.	VIKTOR S[illegible]	[illegible]		[illegible]
22.	Agić Dragan	loc. coor. LEAP	061/346229	[illegible]
23.	Aida M[illegible]ić	DVOKUT PRO	033/447881	[illegible]
24.				
25.				
26.				
27.				

4.2.1. Discussion

Mr. Suad Ridić, representative of Local community Stari Grad: Not one part of our local community has water treatment plant. It can be suggested to proclaim this part as critical and to include it in the mentioned project.

Mr. Esad Omerović, Municipality of Konjic: It is not the case only in Stari Grad, but in Varda and other local communities as well. It will be considered later and separately since it has no negative impact on environment.

Mr. Viktor Simoničić: We could try to include this problem in the LEAP for Konjic Municipality.

Mr. Dženamir Hasagić, Water Management Company from Konjic: This problem was included when alternatives were considered. It was decided to choose alternative with collector on right side of the Neretva River and 2 container types.

Mr. Derviš Dizdarević, Municipality of Konjic: Before the recent war, there was a treatment plant that comprised all factories from ex UNIS company and their wastewaters.

Mr. Viktor Simončić: It is a obligation of Water Management company to make further analysis and estimations for upgrade of canalisation network, re-pumping of waters from Unisgal and to include all o that in projects for financing.

Mr. Izet Camarić, DUMS – Energetika: I think that it will be an epidemic because all the waters will be mixed. This story about the companies is cosmetics only. The biggest polluters break through all canalisations. It should b solved in more comprehensive way.

Mr. Kemo Bilanović, president of Local community Centar: It surprises me that no one from company Tabit has not been informed. They are polluters as well and have damaged water treatment plant.

Mr. Viktor Simončić: LEAP group for waters should seat down together and solve these problems, find better solutions for financing, It is in our interest to help industry to work.

4.2.2. Conclusion

All participants agree with proposed project activities, with proposed measures and EMP. The only that was discussed here is the necessity for more similar projects in order to completely solve this kind of problems in Konjic.

5. Ljubuški

Public Consultations in Ljubuški were held on 27th of July in the City Hall. Invitees were not only stakeholders from Ljubuški, but from Hutovo Blato Nature Park and Vjetrenica Cave as well. Since it is the season of holidays, some of the invited people were prevented to come. Anyway, representatives of public company Ljubuški were and NGO " Slapovi Kravice" were present. Moreover, as a representative of his NGO "Kravice", Mr. Ivica Ramljak was "spokesman" of habitants living nearby existing water treatment plant. Unfortunately, Mr. Andrija Lučić and Ivo Lučić from Tourist Bureau of Vjetrenica could not come, but were very interested in the subject (the only ones from Vjetrenica), and have proposed to arrange a meeting afterwards, and so we did. Short report of that meeting is given at the end of Ljubuški meeting report. List of participants is shown in table 6 below.

Table 6: List of participants at Public Consultations in Ljubuški

GEF Projekat upravljanja riječnim slivovima Neretve i Trebišnjice

Javna rasprava – Ljubuški, 27.07.2006.

Redni broj	Ime i Prezime	Institucija	Kontakt (e-mail, br.telefona)	Potpis
1.	GRIZELJ ZLATKO	JKP „Ljubuša" Ljubuški	zlatko.grizelj@tel.net.ba	[illegible]
2.	Nediljko Granić	JKP „Ljubuški"	nediljko.granic@tel.net.ba	[illegible]
3.	IVAN MIHALJEVIĆ	EKO „SLAPOVI KRAVICE" LJUBUŠKI - PREDS.	063324238	[illegible]
4.	IVICA RAMLJAK	U.S.R. „KRAVICA" LJUBUŠKI	063-457-169	[illegible]
5.	MILAN PETKOVIĆ	OPĆINA LJUBUŠKI	039 835-501 502	M. Petković
6.	Vanja Pozo	Ceptica	[illegible]	[illegible]
7.	Andrea Marković	DVOKUT	andrea.markovic@dvokut.ba	[illegible]
8.	Mario Bajto	Fed. Min. Polj. Vod. i Šum. PIU Šuma i Poljoprivrede	063-322-875 piusum@tel.net.ba	[illegible]
9.	Nikola Tovko	Park prirode „Hutovo Blato"	036 814 716	[illegible]
10.				
11.				

After the presentation of project activities and affiliated EMPs, discussion started.

5.1. Discussion

Mr. Ivan Mihaljević, president of NGO "Slapovi Kravice": You mentioned that water quality has to be monitored. What if it is not good?

Mr. Zlatko Grizelj from public company Ljubuški (operator of WWTP) wanted to give an answer: Daily analyses of main parameters are being done and every two years tests of efficiency of city WWTP are being done. We have problem on primary treatment, first grid, it needs to be changed, as well as mechanical flow limitation and it will be solved by this project. Our canalisation system is of gravitational type; all waters flow to city WWTP and are discharged into Trebižat.
Mr. Nediljko Granić, public company Ljubuški: Concerning the operation of WWTP, we from Ljubuški may be not only satisfied, but very satisfied. It had failure for only one week since it started with operations (1989). This is the first time that serious investment is coming to our city. But, it is extremely important to work more on legislation concerning environment. Also, we have a lot new polluters, such as car wash, industrial facilities, etc. It is important to make a list of these polluters in our area. I was in Velika Gorica in Croatia recently and was amazed by the exhibition they have prepared there. It was an exhibition of objects taken from canalisations. I have to tell you that I was really positively surprised when I saw a turtle 10 days ago at the exit of WWTP, at the discharge point.

Mr. Ivica Ramljak, NGO "Kravica": I am coming from fishing association. Also, I am speaking on behalf of habitants of Matinjevac. We strongly support any investment and hope it will come soon. We have a problem with illness of fish, fish fund decreased to 0,1 %, there are only algae, sludge and nothing else. It has to be analysed what is the cause of it.

Mr. Zlatko Grizelj: This project is very welcome and we all strongly support it. Emphasise has to be on primary treatment, thus the greatest savings will be made on maintenance since impact of human factor will be decreased.

Mr. Ivan Mihaljević, NGO "Slapovi Kravice": We made an application to Ministry of environment of Western Herzegovina Canton for creation of list of septic tanks in the area of Ljubuški Municipality. We think it is extremely important to do so and to bring water in all households within Municipality. Also, it is necessary to make insight into all septic tanks. We hope that this project or any other project could do this and solve these problems.

5.2. Conclusion

All participants consider proposed project a good and necessary investment for Ljubuški municipality and are convinced that it would have very positive environmental impact. Also, they hope that more investments and projects of this type will come to Ljubuški.

5.3. Report from meeting with Vjetrenica people

After short introduction to project activities and presentation of EMPs, discussion followed. In general, both Andrija Lučić and Ivo Lučić (author of Monograph "Vjetrenica") agree with project activities. However, since there was no detailed project to present they could not be sure that they have been willing to accept these activities immediately. First, they would have to see the entire project and all planned activities, including who was the person who made the project and what EXACTLY project activities include. They confirmed that they are willing to co-operate, but it is necessary that entire procedure is transparent and clear. They simply want to avoid any activities that may be performed and cause contra effects on the site. They said that there were some bad examples in the past in the area and they simply want to avoid it happening again.

Conclusion: It is necessary to present Vjetrenica Cave project in details to these stakeholders and then they will make decision about accepting it.

6. Trebinje

Public Consultations in Trebinje were held on 31st of July in the building of Municipality Trebinje. Invitees were not only stakeholders from Trebinje, but from Bileća and Nevesinje as well. After presentation of project activities and affiliated EMPs for all three municipalities discussion followed. List of participants is shown in table 7 below.

Table 7: List of participants at Public Consultations in Trebinje

GEF Projekat upravljanja rječnim slivovima Neretve i Trebišnjice

Javna rasprava – Trebinje, 31.07.2006.

Redni broj	Ime i Prezime	Institucija	Kontakt (e-mail, br.telefona)	Potpis
1.	Драгомир Брњош	XET	dragan_b@het.ba 059/260-213	
2.	[illegible]	XET	065/213-124 dujatovic-b@het.ba 059 270-061	
3.	[illegible]	МУЗЕЈ-ТРЕБИЊЕ	МУЗЕЈ НТР GTEOL.NET	
4.	ЗДРАВКО МРКОЊА	XET	Z.MRKONJA@SPINTER.NET	
5.	NOSOVIĆ DUŠANKA	OPŠTINA BILEĆA	opurban@teol.net	
6.	Милован Цвијетић	Општина Невесиње	065/586-636	
7.	ĐURASOVIĆ MILJAN	OPŠTINA NEVESINJE	opstinan@teol.net 065/859-130	
8.	Бања Тамишчија	Општина Невесиње	065/985-933	
9.	Милан Бакмаз	Општина Требиње	065/338-487	
10.	Vujadin Stanica	Opština Trebinje	065/994-880	
11.	Мрдић Бања	Општина Требиње	065/339 804	

12.	Ljuban Rikalo	opština Trebinje	065-641530 ljrikalo@Paleol.net	
13.	Andrea Marković	Dvolut Pro	andrea.markovic@dvokut.ba	
14.	Vanja Tatić	Optika	st.optika@dvokut.ba	
15.				
16.				
17.				
18.				

6.1. Discussion

Miljan Đurasović, Municipality Nevesinje: Main collector in Nevesinje is finished. Now we are preparing activities for reconstruction of channels that you presented. No one asked Municipality to give detailed technical data, so they were not delivered. We have a problem that faecal outlets go to two existing channels for rainfalls, but we do not know where exactly. There are no WWTP, only collector and discharging of wastewaters is directly to recipient. It is necessary to construct WWTP as soon as possible in order to solve these problems.

Dragomir Brnjoš, HET Trebinje: It is necessary probably to make pre-feasibility studies for Trebinje and Nevesinje as well, so that all project activities are defined in details.

6.2. Conclusion

No one had any negative remarks towards EMPs or definition of projects. The only component common to almost all Public Consultations is that all would like to have more activities and more projects to solve their problems. Anyhow, everyone support projects activities and look forward to positive changes and improvement of environment and consequently improvement of life quality.

7. Ploče – Baćinska Lakes

Public Consultations in Ploče were held on 2nd of August 2006 at Hotel "Bebić" in Ploče. Meeting was organized in cooperation with Ms. Ana Musa from PPP "Lijepa naša" and Local authorities. Representatives form Croatian waters were invited as well and they promised that someone from regional offices in Ploče, Metković, Opuzen or Split will be present, but unfortunately no one showed up. There were present representatives from three NGOs, local authorities, tourist community and REC office from Metković. After the meeting site visit to Baćinska Lakes was organized and it was amazing, showing all the beauty of nature and environment. List of participants is shown in table 8 below.

Table 8: List of participants at Public Consultations in Ploče

GEF Projekt upravljanja ekosustavima rječnog sliva Neretve i Trebišnjice

Javna rasprava – Ploče, 02.08.2006.

Redni broj	Ime i Prezime	Institucija	Kontakt (e-mail, br.telefona)	Potpis
1.	Ana Lucas	PPP „Lijepa naša" Ploče	lijepanasa@inet.hr 091 6788230	
2.	Tonči Krilić	EU PLOVUCA - BAČINA	tkrilic@inet.hr 091-679-1155	
3.	Ivo Marinović	-11-	ivo.marinovic@zg.htnet.hr	
4.	Ivan Dragić	REC Hrvatska	098-560-990	
5.	ERS MARCZIN	REC HUNGARY	0036265404074	
6.	TOMISLAV RAGOSIĆ	REC METKOVIĆ	020/681-714	
7.	MILIĆ ANDRIJA	GEFO PLOČE Predsj. Zajednice	020/679-501)	
8.	Vitko Tomašević	Grad Ploče Poglavarstvo	091-531-1279	
9.	Andrea Marković	Dvokut Pro	andrea.markovic@dvokut.ba	
10.				
11.				

After presentation of planned activities and affiliated EMPs discussion followed. It was actually very vivid discussion; since there were present all local people, decision makers on certain levels and in certain areas.
After the meeting, the next day, e-mail came to Consultant with official letter from Ploče Mayor. Letter reflects the most issues covered during the meeting and it is translated at the end of this text.

7.1. Discussion

Mr. Andrija Milić, Tourist Community – There is a study on salinity prepared by Romić and Vranješ. Maybe that will be used when preparing the new salinity study.
Mr. Vitko Tomašević, City of Ploče – Until the end of 2008 we expect closing of existing dump in cooperation with Environmental Protection Fund. There is a finished Environmental impact study, geology base and permit for remediation and closing has to be issued soon. City supports all proposed projects since objectives of all of them are to protect environment and improve quality of life. From the spring till mouth of Neretva, city of Ploče is the most endangered city. Our opinion is that Ploče are not directly included in the project, only Opuzen and Metković are mentioned. Before, water from Baćinska Lakes was potable, nowadays only hand washing is possible.

Ms. Meri Rogošić, REC office Metković – River Neretva has 10 times more nitrates then other rivers and it is the most polluted in regards with faecal pollution.

7.2. Translation of letter received by e-mail from City of Ploče, signed by Mayor

Concerning the preparation of GEF Project «Proposed Integrated Ecosystem Management of Neretva and Trebišnjica River Basin», and regarding yesterday's meeting held in Ploče on August the 2nd 2006:

City of Ploče supports mentioned projects completely understanding that they contribute to environmental protection and are directly connected with life quality improvement in this. Thus, City of Ploče wants to be directly involved in preparation of project documentation and project implementation.

We consider important to place City of Ploče through project implementation in a position where it belongs considering the fact that Ploče is on the very mouth of river Neretva and all pollution, as well as possible solutions, directly affect life quality. All that comes with River Neretva stays in Ploče Bay and that is why we are grateful that problems are being solved upstream. Through other cities Neretva flows and goes further and here is where it mouths to Adriatic Sea and keeps all that comes with it.

In order to complete solution for wastewaters that come to Ploče Bay, where Ploče itself discharges untreated wastewaters, the City took steps regarding preparation of certain documentation:

- Environmental Impact Studies of undersea outlet with diffuser;
- Disposition of wastewaters in grasp GUP Ploče is divided in phase construction and in more stages. In the first stage it is foreseen to construct undersea outlet (1800 m) of wastewater treatment plant into Neretva channel, pressure pipeline with siphon over sea

surface «harbour Ploče» and main pumping station. In that way drainage of wastewaters from urban part of City of Ploče would be solved and it is an upgrade to already planned systems in upstream flow of River Neretva. Second stage is linkage and construction of separated drainage systems, which raises maintenance costs and has significant impact on pollution of both water stream and entire Ploče Bay.

- Program of salinity prevention of currently arable land that will become saline should be taken in co-operation with Croatian waters and Board for irrigation in Neretva Delta. Following that, Civil Engineering Faculties in Split and Zagreb prepared the Study that gives relevant data on endanger and possible solutions.

Baćinska Lakes

We intercede for preparation of comprehensive document – Study on endanger of Baćinska Lakes that will indicate necessity and way of protection of lakes.

Baćinska Lakes are nature jewel and to preserve its status they need to be protected in appropriate way.

Two main polluters are communal waste disposal site «Lovornik», in vicinity of lakes and unsolved issue of canalisation network. City of Ploče has its own limited funds for preparation of Environmental Impact Study and technical documentation, but City doesn't have enough funds for financing remediation.

It is necessary to maintain and protect existing water sources, especially because the biggest water source Klokun brings smaller amounts of water into lakes since its usage for potable water is higher every day.

In winter periods, through tunnel Krotuša a large amount of ground and sludge comes into lakes and covers them. Water objects (tunnels, arrays, connections between lakes etc.) should be maintained in a far better manner.

It is necessary to prepare behavioural codex for area of lakes and educate local population to provide measures of better protection.

Mutual objective is to protect nature for our sake and sake of future generations, and not to take for globalisation granted and ravish nature by turning it against us instead of coexisting with nature.

Annex 7: ToR - Terms of References

Bosnia Herzegovina and Croatia
Proposed Integrated Ecosystem Management of the Neretva and Trebisnjica River Basin (NTRB) Project

Terms of Reference for Environmental Impact Assessment

Background

The Neretva River (220 km), the largest river in the Eastern Adriatic watershed, is an international waterway shared by Bosnia Herzegovina (B&H) and Croatia. Within B&H it has additional transboundary characteristics as it is shared by two entities - the Federation of Bosnia Herzegovina (FB&H) and the Rebuplika Srpska (RS)[14] – each with its own government and body of law. The Trebisnjica River (99 km) and its basin are located entirely in the RS but are hydraulically linked to the Neretva River. The Neretva and Trebisnjica River Basins (NTRB) ecosystems include wetlands of international significance. The lower course of the Neretva River from Mostar (FB&H) to the river's mouth (Croatia) contains the largest and most valuable remnants of the Mediterranean wetlands in the Eastern Adriatic coast and is one of the few areas of this kind remaining in Europe. The NTRB are also considered to be of great cultural/historic importance with ruins dating back to the 4th century B.C.

The NTRB play an important part in the economies of both countries. The rivers are used by the population for transport, gravel and sand extraction, recreation, fisheries, fishing and abstraction for drinking water, irrigation and energy. Despite their dominant hydroelectric power purposes, several reservoirs in each basin are multi-purpose providing for flood protection, water supply of industry and irrigation, and provision of minimum biological flows. Southeast Europe regional development activities planned in the NTRB include expansion of the existing regional traffic routes which criss-cross the basins (e.g. Sarajevo –Ploce railroad, Adriatic Highway) and potential development of hydropower. There are already five hydropower plants (HPP) on the Neretva River with four more under consideration; and four HPP on the Trebisnjica River. The natural beauty and cultural heritage of the NTRB support some local tourism but the potential is largely untapped.

[14] The state of Bosnia and Herzegovina is regulated by the Dayton General Framework Agreement for Peace (1995) and is comprised of three separate administrative units: (i) the Federation of Bosnia Herzegovina, the Republic Srpska and the District of Brcko.

Bosnia and Herzegovina and Croatia
Proposed Integrated Ecosystem Management of the Nerteva and Trebišnjica River Basin (NTRB) Project

The problem is that current management practices for water resources in NTRB have been unable to deter degradation, in terms of quality and quantity, to the resource itself as well as to the basins' ecosystems, particularly wetlands. Pressures on water resources and their associated ecosystems are inter-related and include: conversion of wetlands and other critical natural habitats to agriculture; illegal land possession/construction in sensitive and/or protected areas; excessive illegal hunting and fishing in the wetlands; unsustainable agriculture practices including excessive use of pesticides and lack of crop rotation; interference with the hydrological regime of the NTRB for agricultural, municipal, industrial and hydropower use of water; inadequate flood control; water pollution from point (municipal and industrial wastewaters, solid waste dump sites) and non point (agricultural) sources; and lack of public awareness and involvement. While these pressures represent competing water demands by users, a characteristic of many river basins, in the case of the NTRB the problem is that demands for water resources are not balanced through any comprehensive and coordinated strategy. The cumulative negative impacts of these pressures include a documented loss of habitat and biodiversity; land degradation and reduced agricultural productivity; sedimentation and erosion leading to reduced efficiency of reservoir operations; Stalinization; and salt water intrusion. The problem has resulted from comprehensive and harmonized institutional, legal and policy frameworks for water resource management in each country and across borders. However, there is an evident increasing realization of the importance of transboundary cooperation in improved water resource management. Each country and entity have identified improved water resource management and biodiversity conservation as key development and environmental issues.

Proposed Project Objectives and Description

The objective of the project is improved management of transboundary water resources in the project region through a strengthened national and transboundary institutional framework; application of integrated, river basin-level resource planning which lays the basis for efficient and equitable water allocation amongst users; maintenance and conservation of sensitive basin ecosystems; and pilot investment projects. The strategy to meet the project objective is to: (i) introduce an integrated water resource management approach (ii) support biodiversity conservation within key water dependent ecosystems; and (iii) demonstrate linkages between economic development and sustainable natural resources use. The project is to be implemented over five years. GEF financing of approximately US$8 million will be allocated approximately US$2 million to Croatia and US$6 million to B&H, depending on final project design.

Contents of project components can be modified till the end of the project preparation. Final contents of the components will be defined with the final report of previous studies. Project components on this project preparation level are the following:

Component 1. Transboundary water resource management on the Neretva and Trebisnjica River Basins This component would promote development of institutional mechanisms for transboundary river basin management; develop a NTRB management plan utilizing an integrated

water resource management approach and finance the studies to support the plan, e.g an environmental flows assessment; support transboundary management tools including a basin-wide measurement, monitoring, modeling and database management system; and support training and capacity building.

Component 2. Ecosystem management and biodiversity conservation Since the wetlands ecosystems of the Neretva River Basin are designated as globally significant and a Ramsar site, their conservation is an international obligation of both countries and a key component of the project. This component would finance activities for the maintenance, conservation and protection of sensitive ecosystems and their associated biodiversity within the NTRB. This could include an inventory of the biodiversity resources of the project region identifying key habitats, species and ecosystems for protection and/or restoration and development of specific strategies to address problems, e.g. hunting strategy; studies to determine the influence of water regime on ecosystems; identification of basin ecological objectives; improved facilities for conservation, e.g. nature museum, protected area facilities. This component would also finance a research grants program to promote transboundary exchange and cooperation on scientific studies.

Component 3. Community based resource conservation This component would support demonstration projects which show how communities living in vulnerable land/water environments can benefit from improved opportunities that arise when water resources and ecosystems are managed more effectively. The component could also finance broader investments in water management infrastructure. The projects would be selected through a competitive grants program which will be implemented according to an Operations manual.

Component 4. This component would support project management operations in each country.

If any possible changes of project components emerge, they will be submitted to the consultant.

The project region includes, by definition, the basins of the Neretva and Trebisnjica rivers which comprise the Adriatic watershed of Bosnia Herzegovina and the lower course and delta of the Neretva River in Croatia. The total area is approximately 10,000 km^2. The Neretva River (220 km) is an international waterway shared by Bosnia Herzegovina (B&H) and Croatia. Within B&H it has additional transboundary characteristics as it is shared by two entities - the Federation of Bosnia Herzegovina (FB&H) and the Republic of Srpska (RS) – each with its own government and body of law. The Trebisnjica River (99 km) and its basin are located entirely in the RS but are hydraulically linked to the Neretva River. (Annex 1: Map). The lower course of the Neretva River from Mostar (FB&H) to the river's mouth (Croatia) contains the largest and most valuable remnants of the Mediterranean wetlands in the Eastern Adriatic coast and is one of the few areas of this kind remaining in Europe. The NTRB are also considered to be of great cultural/historic importance with ruins dating back to the 4^{th} century B.C.

Key existing technical studies

Project preparation included the following studies the results of which should be used in preparing the EA:

#1. Transboundary assessment of the ecosystems and biodiversity of the NTRB. This study provides a comprehensive analysis of the state of the environment in the project region, focusing on the biodiversity and protected area management issues. It includes an assessment of cultural heritage resources.

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#2. Water and land management in the river basins: This study reviews water management (including environmental flows), water use and users (hydropower, irrigation, agriculture, drinking water, recreation, fisheries) and land use. Problems and root causes are identified.

#3. Economic valuation of biodiversity, natural and cultural resources of the project region. This study identifies the economic value of the existing resources (water, land, forests); what the current uses of the resources are in the basin and the efficiency of these uses; identification of socio-economic aspects of the threats to water and land resources, e.g. the impacts of tourism, local industry, the consumptive use of natural resources (forestry, agriculture, grazing, hydro-technical works, traffic); identification of existing local development initiatives that demonstrate linkages between economic benefits for local communities and improved water resource management, e.g. rural tourism, traditional community activities, provision of accommodation in traditional homes, guiding and site interpretation, local production of handicrafts, and traditional agriculture; identification of key stakeholders with analysis of their capabilities, interests, conflicts, and potential roles in project implementation.

#4. Social Assessment. This study identifies important social and rural development issues that need to be addressed and their relation to project objectives. It assesses the current level of participation of communities in decision making for water resource management; identify the existing structure and mechanisms needed for community participation in the project and necessary resources; recommends how best to support community based organizations so as to facilitate a partnership with water and environment, with concerned NGOs, and with county/cantonal/municipal development committees, as appropriate.

Applicable World Bank Environmental and Social Safeguard Policies and Related Requirements

Review of the proposed project indicate that the following World Bank Safeguard policies would be triggered by the proposed project:

OP4.01 – Environmental Assessment. The propose project has been classified as a Category B project and therefore requires an Environmental Assessment (EA).
The Bank requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making. The EA is required to evaluate the project's potential environmental risks and impacts in its area of influence. It aims at identifying ways of improving project selection, citing, planning, design, and implementation by preventing, minimizing, mitigating, or compensating for adverse environmental impacts and enhancing positive impacts. The process includes the means for mitigating and managing adverse environmental impacts throughout project implementation. The Bank favors preventive measures over mitigatory or compensatory measures, whenever feasible.

The EA will need to assess the impacts of any infrastructure/construction impacts

The proposed project includes analyses of alternatives if any, Land use on project sites, Impacts during construction, (all relevant impacts), Landscape impact, Climate , Flooding, Water supply impacts, Conversation management and Monitoring, EMP, definition of hot spots Environmental risk assessment for accidental pollution, Environmental base line situation, Terrestrial and Aquatic Biodiversity, Cultural heritage, Water quality monitoring, Cost estimate for EMP, Regional context of the projects.

The environmental issues that may require attention would be related to Component 2 (Ecosystem management and biodiversity conservation) and Component 3 (Community based resource conservation). Component 2 would include small civil works for rehabilitation of existing structures, e.g. visitor center; and improved protected area management, e.g. trails, information kiosks. Component 3 would finance demonstration projects to be determined during preparation. EIAs and environmental management plans would be required for each demonstration project. The small grants program under this component would be administered according to an operations manual which would include guidelines for environmental analysis and monitoring of small grants.

The project might finance restoration works in cultural or historical monuments in the Neretva delta (Croatia). Croatia's "Cultural Property" regulations, which have been reviewed under previous WB projects and found satisfactory (Croatia Municipal Infrastructure Project), would apply.

These anticipated impacts are site-specific and few if any of them are irreversible. The EA examines the project's potential negative and positive environmental impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

Safety of Dams OP/BP4.37 The project triggers the Operation Policy of Safety of Dams (OP4.37). The two elements of OP4. 37 which are relevant to the project area: (i) safety, e.g. environment would be devastated in case of uncontrolled release of water from the reservoirs; and (ii) reliable operation, e.g. if a management river flows framework is agreed upon, the physical infrastructure should be capable of implementing it. As such, the World Bank requires the borrower to arrange for an independent dam specialist to (i) inspect and evaluate the safety status of the existing dams (>15 m in height), its appurtenances, and its performance history; (ii) review and evaluation the owner's operation and maintenance procedures; and (iii) provide a written report of findings and recommendations for any remedial work or safety-related measures necessary to upgrade the existing dam to an acceptable standard of safety. The dam safety assessment is a separate report from the EA.

Cultural Property The project might finance restoration works in cultural or historical monuments in the Neretva delta (Croatia). Croatia's "Cultural Property" regulations, which have been reviewed under previous WB projects and found satisfactory (Croatia Municipal Infrastructure Project), would apply

International Waterways OP 7.50 This safeguard is triggered as the Neretva and Trebisjnica River Basins are transboundary with B&H and Croatia. The two riparian countries are considered "notified" already as they are both part of the project. The Trebisjnica River is entirely within B&H.

Scope of Work

This consultancy should produce an environmental assessment (EA) and environmental management plan (EMP) for the identified project components. It should also produce environmental guidelines for analysis of projects to be financed under the grants program.

I. EA: The EA should include:

Executive summary. Concisely discuss significant findings and recommended actions contained in the main documents

Policy, legal and administrative framework. Discuss the policy, legal and administrative framework within which the EA is carried out. Explain the environment assessment requirements of each country as they relate to the project. Identify relevant international environmental agreements to which the countries are party. The key safeguard issues should be described and the countries' requirements to address these described.

Project Description. Concisely describe the proposed project and its geographic, ecological, social and temporal context, including any offise investments that may be required. Include a map showing the project sites the project area's influence. The project region includes, by definition, the basins of the Neretva and Trebisjnica rivers which comprise the Adriatic watershed of Bosnia Herzegovina and the lower course and delta of the Neretva River in Croatia. The total area is approximately 10,000 km^2. The Neretva River (220 km) is an international waterway shared by Bosnia Herzegovina (BiH) and Croatia. Within BiH it has additional transboundary characteristics as it is shared by two entities - the Federation of Bosnia Herzegovina (FBiH) and the Republic of Srpska (RS) – each with its own government and body of law. The Trebisjnica River (99 km) and its basin are located entirely in the RS but are hydraulically linked to the Neretva River. (Annex 1: Map). The lower course of the Neretva River from Mostar (FBiH) to the river's mouth (Croatia) contains the largest and most valuable remnants of the Mediterranean wetlands in the Eastern Adriatic coast and is one of the few areas of this kind remaining in Europe.

Base line Data. Assess the dimensions of the study area and describe the relevant physical, biological and socioeconomic conditions. Data should be relevant to decisions about project location, design, operation or litigator measures.

Environmental impacts: Predict and asses the project project's likely positive and negative impacts in quantities terms to the extent possible. Identify mitigation measures and any potential negative impacts that cannot be mitigated.

Analysis of alternatives. Compare feasible alternatives to the project technology, design and operation including the "without project" situation – in terms of their potential environmental impacts; the feasibility of mitigating these impacts; their capital and recurrent costs; suitability under local conditions. State the bass for selecting the particular project design proposed.

Record of interstate and interentity consultation meetings on the EA.

II. Environnemental Management Plan

The Consultants are required to development an Environmental Management Plan (EMP) with focus on three generic areas: Mitigation measures, institutional strengthening and training, and monitoring. The EMP should include:

Mitigation of environmental impact: Recommend feasible and cost-effective measures to prevent or reduce significant negative impacts to acceptable levels. Estimate the impacts and costs of those measures. Consider compensation to affected parties for impacts that cannot be mitigated. The plan should include proposed work programs, budget estimates, schedules, staffing and training requirements, and other necessary support services to implement the mitigating measures.

Institutional strengthening and training: Identification of institutional needs to implement environmental assessment recommendations. Recommend any additional support that should be provided to the PIUs to strengthen or expand them so that the management and monitoring plans in the environmental assessment can be implemented. The institutional needs should be presented separately for the two countries and two entities as well.

Monitoring: Prepare detailed arrangements for monitoring implementation of mitigating measures and the impacts of the project during construction and operation. Include in the plan an estimate of capital and operating costs and a description of other inputs (such as training and institutional strengthening) needed to carry it out.

III. Environmental Guidelines for Analysis of sub-projects
The Consultant are required to prepare environmental guidelines to be included in the project Operations Manual. The purpose of the guidelines is to provide instructions to the borrower on the analysis of projects submitted to the grants program. Generic guidelines will be provided to the Consultant and will need to be adapted for the purposes of the project.

Duration schedules and place of work

Consultant is expected to start his work ten days after contract signing i.e. on March__, 2005 and until April_, 2005, i.e. the contract will be completed up to 1 (one) calendar month period.
The candidate would be expected to work throughout the project region per this TOR.

Consultants qualification

The consultant should have experience in the similar assignments. The Consultant should propose a multidiscipline team to carry out the environmental assessment considering the amount of basic data and studies already available for both Croatia, RS and FB&H. The team, as a minimum requirement, should comprise an environmental specialist and a water resources management specialist.

Reporting requirements

1. Delivery of an **inception report** satisfactory to the PIU and World Bank which outlines the approach to the assignment; a timeframe; a schedule for stakeholders consultations/workshops; issues to be resolved and outstanding concerns. The inception report should be submitted within 1 week after signing of the contract.

2. The deliverables are an EA, satisfactory to the World Bank and the client, that follows the format described above; and EMP that follows the format described above and the sample attached; and environmental guidelines to be included in the project Operations Manual. The purpose of the guidelines is to provide instructions to the borrower on the analysis of projects submitted to the grants program. Sample guidelines will be provided. The consultant must conduct a public consultation of the draft EA and EMP.

The deliverables should be submitted to the PIU Office in Banja Luka in hard copy and electronic form. They will be reviewed and commented by the PIU and the Consultant will be required to complete any outstanding work and finalize the three deliverables with the comments incorporated. All deliverables should be submitted in English and the local language. The consultant will provide 3 copies in English and 5 copies in local language, together with diskette files of all materials produced.

ANNEX 8: RARE, ENDANGERED AND PROTECTED SPECIES IN NRTB

Extracts from the Study**:** "Transboundary Assessment of the Water Dependent Ecosystems and Water Resource Management in the Neretva and Trebišnjica River Basin"

Rare, endangered and protected species

Microphytes

There are no rare, endangered or protected species of phytoplankton and microphytobenthos in the Neretva and Trebišnjica river basins. Some benthos diatoms were included in the Red book of endangered species of Germany and Belgium; there are no data for the plankton forms.

Vascular flora

***Rare, endangered and protected species of vascular flora of the upper part of the Neretva river basin*:** Unlike Croatia (Nikolić and Topić 2005), Bosnia and Herzegovina does not have a *Red book of vascular flora*. Bosnia and Herzegovina published the *List of rare, endangeded, and endemic plant species of Bosnia and Herzegovina* (Šilić 1996), compiled according to the criteria of the International Union for the Conservation of Nature and Natural Resources (IUCN 1983, 1994). The list consists of 678 species cathegorized according to IUCN criteria. A total of 16.95% of species of Bosnia and Herzegovina falls under one of the threatened species categories. Of course, this data should be taken with a grain of salt, since it is based on the assumption that the flora of Bosnia and Herzegovina consists of ca 4000 species (assumption by Bjelčić 1987).

The list includes 13 species of trees and 62 species of bushes and shrubs. The largest number of endangered species (included are only the families with the largest number of species) belong to the families *Euphorbiaceae* (8 species), *Caryophyllaceae* (34 species), *Ranunculaceae* (31 species), *Brassicaceae* (25 species), *Violaceae* (10 species), *Saxifragaceae* (7 species), *Rosaceae* (24 species), *Fabaceae* (35 species), *Apiaceae* (31 species), *Primulaceae* (13 species), *Boraginaceae* (12 species), *Scrophulariaceae* (50 species), *Lamiaceae* (34 species), *Dipsacaceae* (19 species), *Campanulaceae* (29 species), *Compositae* (78 species), *Liliaceae* (29 species), *Iridaceae* (13 species), *Cyperaceae* (12 species), *Poaceae* (15 species) and *Orchidaceae* (28 species). Three species are extinct (EX), five are probably extinct (EX?), 43 are

endangered (E), 286 are vulnerable or endangered (VU), while 52 species are data deficient (DD). A large number of species (289) belong to the category of rare (R) or potentially endangered species, which are not directly endangered, but are facing a high risk of extinction. These are species of a narrow range, mostly endemic and relict species of fauna of Bosnia and Herzegovina.

A large percentage of those species are found in the Neretva river basin, namely in its upper and central parts (about 32% of the total number from the Red list). This number consist mostly of species of the Illyrian flora element, species on mountains of the endemic centre of Herzegovina, and the Arcto-Alpine species on the highest mountaintops (mountain alpine meadows).
Table 3.1.52 contains the abundance of flora and number of endangered species of Bosnia and Herzegovina compared with other, mostly neighbouring countries. According to the selected parameters, the flora of Bosnia and Herzegovina is closest to the Croatian flora. Bosnia and Herzegovina has the largest number of endangered species in total flora. In comparison, only 8.49% of endangered Croatian flora is also endangered in Bosnia and Herzegovina (Nikolić 2001).

Table 3.1.52 Comparison of the total number of species of vascular flora in Bosnia and Herzegovina and certain European countries.

No.	Country	No. of species	% endangered	Surface (sq.km.)	No of species /sq.km.
1	Slovenia	3126	12	20251	0.15881
2.	Albania	3031	2.60	28748	0.10543
3	Croatia[1]	4275	11.01	56538	0.07561
4.	Croatia[2]	5347	8.80	56538	0.09457
5.	Serbia and Montenegro	4282	-	102173	0.04191
6.	Italy	5599	5.60	301249	0.01859

7.	Hungary	2411	1.40	93030	0.02592
8.	Romania	3400	2.90	237500	0.01432
9.	Bulgaria	3572	3,00	110912	0.03221
10.	***Bosnia and Herzegovina***	***4000****	***16.95***	***51129***	***0.07823***

Legend: 1 – number of species; 2 – number of species and sub-species; * - according to Bjelčić (1987) (adapted according to Nikolić 2001).

The comparison of the absolute nuber of species with the number of (endangered) species in other European countries does not make much sense because the difference between the sizes of compared areas is sometimes great. Also, the comparison and assessment of the number of species in the whole of Bosnia and Herzegovina and in the area of the Neretva river basin are difficult. The Neretva river basin takes up one fifth of the total area of Bosnia and Herzegovina. Larger areas usually contain a wider range of gradients of ecological factors (along the geographical longitude and latitude, height above sea level, climatic zones) and heterogenity i.e. diversity of habitats, which in most cases directly influences the increased number of species (Hawksworth and Kalin-Arroyo 1995).

A more realistic indicator would be the ratio of number of species and the area where they were registered. By such a comparison, Bosnia and Herzegovina takes up a high place in Europe, possibly before Croatia which is third according to current data, after Slovenia and Albania. But all these are preliminary assessments which are to be evaluated in the future. First of all, it would be of importance to establish the *Index of flora*, if not publish the overall *Flora of Bosnia and Herzegovina* (which would not be realistic to expect at this moment), and then the *Red book*.

The species *Leontopodium alpinum* and *Gentiana lutea* subsp. *symphyandra* are protected by law.

Chapter 2.2.5 *Protection of Endangered Species*, Article 10 of the Bosnian Forest Act prohibits logging, uprooting, or any other damage to a total of eight species of trees, with the exception of cultivation and sanitary logging. The species are:

- *Picea omorika,*
- *Taxus baccata,*
- *Corylus colurna,*
- *Acer heldreichii,*
- *Pinus mugo,*
- *Alnus viridis,*
- *Pinus heldreichii,*
- *Petteria ramentacea.*

Most of these species inhabit the Neretva river basin.
In the upper part of the Neretva river basin, the rare plants are usually relicts of ancient flora and mostly belong to boreal and Arcto-Alpine species: *Dryas octopetala*, *Arctostaphyllos alpinus*, *Sedum atratum*, *Leontopodium alpinum* etc.

Bjelčić (1970) lists three species as very rare (glacial relict) in the wider area of the upper part of the Neretva river basin, which belong to the boreal-montane element: *Drosera rotundifolia*, *Eriophorum gracile* and *E. angustifolium*. They were found in the remnants of vegetation that represents the degraded variant of classic boreal vegetation of central European transitional fens.

Rare, endangered, and protected species of vascular flora of the central part of the Neretva river basin: out of the rare, endangered and protected species in this part of the Neretva river basin, especially important are:

A. Eumediterranean-submediterranean species which inhabit canyons: *Selaginella denticulata* (along the Neretva valley up to Mostar), *Adiantum capillus veneris* (Neretva canyon, Drežanka valley, Jablanica), *Euphorbia wulfenii* (up to Jablanica), *Anemone hortensis* (up to Podveležje), *Seseli tommasinii* (Neretva canyon, Grabovica canyon, Drežanka canyon), *Chaerophyllum coloratum* (Grabovica valley, Jablanica), *Bupleurum veronense* (Drežnica, Grabovica, Doljanka, Jabljanica), *Pistacia terebinthus* (up to along Diva Grabovica), *Phillyrea media* (up to Aleksin Han), *Satureja montana* subsp. *montana* (up to Jablanica), *Satureja cuneifolia* (up to Salakovac in Neretva canyon), *Calamintha glandulosa* (up to Doljanka), *Salvia offcinalis* (deep into the hinderland, along Neretva and its tributaries), *Micromeria juliana* (up to above Drežnica), *Vitex agnus castus* (Mostar) (according to Pavlović et al. 1982). Some of the species are also present in the lower part of the river basin.

B. Rare species: *Asplenium lepidum* (Neretva, Grabovica, Drežnica), *Legousia hybrida* (Dražanka valley), *Cardamine carnosa* (above Salakovac), *Dianthus cruenthus* subsp. *cruenthus* (Diva Grabovica, Doljanka), *Scabiosa graminifolia* (lower Drežnica).

During the recent phytocenological research of Herzegovian canyons in the Neretva river basin, Lovrić et al. (2000) collected about 20 significant (thermophylic) species which were up to now unknown or at least rare and doubtful in the flora of Herzegovina (see: Beck et al. 1903-1983). These are: *Acer orientale* (*A. sempervirens* s.l.) in Ugrovača canyon; *Acer velutinum* (*A. villosum*) in canyons of Drežnica, Doljanka and Glogošnica; *Anthericum liliago* subsp. *balcanicum* in lithosols and below cliffs (more frequent on dolomite), and in canyons of central Neretva, Drežnica, Doljanka and near Livno; *Arabis hornungiana*, upper Neretva, Doljanka, Rama and near Livno; *Aristolochia lutea*, frequent in most canyons in Herzegovina; *Asplenium csikii*, on warm submediterranean cliffs in canyons of Drežnica, Ugrovača, Buna, Bregava and near Livno; *Asplenium dolomiticum* (*A. tauricum*), on submediterranean cliffs in canyons of central Neretva, Drežnica, Doljanka and Glogošnica; *Carpinus caucasica* (*C. oxycarpa*), in canyon submediterranean woods along Drežnica and Doljanka; *Centaurea pannonica* subsp. *substituta* (*C. „pannonica*" auct. medit.), in valleys of Neretva, Drežnica, Ugrovača, and in most karst fields in Herzegovina; *Ceterach javorkeanum* (*Asplenium ceterach* subsp. *bivalens*), on sunny canyon cliffs in northern Herzegovina, along upper Neretva, Glogošnica, Doljanka and Rama, near Livno and Šuica; *Cymbalaria pallida* (*Linaria pallida*), warm and shady canyon cliffs along central Neretva, Drežnica, Ugrovača and Bregava; *Dryopteris submontana* (*D. californica*), submediterranean screes in Herzegovian canyons along central Neretva, Doljanka, Glogošnica, Drežnica, Ugrovača; *Juniperus navicularis* (*J. transtagana*), northern Herzegovina and southwestern Bosnia, valleys of upper Neretva, Glogošnica, Doljanka and Rama, near Livno and Šujica, and along Butišnica; *Sedum clusianum* (*S. album* subsp. *gypsicolum*), southern Herzegovina, cliffs and screes in the warmest canyons of Buna, Ugrovača and Bregava; *Sedum orientale* (*S. dinaricum*), sub-endemic species on submediterranean cliffs and screes, canyons of central Neretva, Drežnica and Ugrovača; *Seseli globiferum*, canyons along Bregava, Buna, Ugrovača and Drežnica.

Rare, endangered and protected species of vascular flora of the lower part of the Neretva river basin: out of rare, endangered and protected species, the lower part of the Neretva river basin, which partially corresponds to the Mediterranean region of Bosnia and Herzegovina, is inhabited by more than 10% of the species from the *List of rare, endangered and endemic plants of Bosnia and Herzegovina*. The threat status was determined on the basis of the number of populations of species on the level of Bosnia and Herzegovina, based on the data collected in the previous 130 years of research. A part of Bosnia and Herzegovina which bio-geographically belongs to the Mediterranean region is relatively small, so it could be expected that many species, which are not categorized as endangered in the neighbouring areas of Croatia, would be on the *List* according to the *Red book of vascular flora of the Republic of Croatia* (Nikolić i Topić 2005). In the lower part of the delta and surrounding area, 13 species of plants (according to Horvat et al. 1974, and references in Jasprica and Buntić 2003) were classified as either critically endangered, endangered, or vulnerable.

Those are the following species (after the names are categories of global endangerment, regional endangerment, criteria of assessment and the population trend):

1 *Baldellia ranunculiodes*, CR (EN), EN, A4ac, reducing?
2 *Blysmus compressus*, EN, VU, A4c, reducing
3 *Cyperus flavescens*, VU, NT, A4c, reducing
4 *Cyperus fuscus*, VU, NT, A4c, reducing
5 *Cyperus longus*, VU, NT, A4c, reducing
6 *Cyperus michelianus*, VU, VU, A4c; B1ab (ii,iii)+2b(iii), reducing
7 *Cyperus serotinus*, VU, VU, A4c;B2b(iii), reducing
8 *Eleocharis carniolica*, EN, EN, A4c, reducing
9 *Fimbristylis bisumbellata*, CR, CR, A4c;B1ab(iii)+2b(iii), reducing
10 *Hydrocotyle vulgaris*, CR, EN, A4c, reducing
11 *Periploca graeca*, EN, EN, A4ac, reducing?
12 *Wolffia arrhiza*, VU, NT, A3c;B2b(ii,iii)
13 *Dorycnium rectum*, CR, EN, B2a+b (ii,iii), stable? (Topić et al. 1996)

Most of the said species belong to the Mediterranean amphybian communities of low sedges (*Fimbrystilion dichotomae*); they develop along riverbeds on occasionally flooded areas. Regulation of watercourses and drainage eliminated the periodical flooding of the coast, so the communities are fragmentary developed, and these species are already very rare in the lower part of the delta (Opuzen and below).

Another endangered species or two will most probably be found on the surrounding karst elevations, especially from the family *Orchidaceae*, but there are no data on the presence and/or range of these species in that area. Even though the revision of the number of populations of orchids in Croatia has not been conducted yet, according to recent data, "the ecological status and size of populations of orchids are adequate, and sometimes even better than the common, pesimistic opinion in scientific literature" (Kranjčev 1999). The same autor, in his work *Orchids of Croatia* (2005), does not list the Neretva delta and neighbouring karst area as an orchid garden.

In this area there are no steno-endemic species, nor species protected by law.

According to the *List of rare, endangered and endemic species of Bosnia and Herzegovina* (Šilić 1996), and based on available literature (Jasprica 2001, Jasprica and Carić 2002), 28 plant species in the Bosnian part of the Neretva delta (lower part of the river basin) can be categorized as either critically endangered, endangered, or vulnerable.

The largest number of species (22) belongs to the category of vulnerable species (VU): *Thelypteris palustris*, *Marsilea quadrifolia*, *Celtis tournefortii*, *Nuphar lutea*, *Hippuris vulgaris*, *Hydrocotyle vulgaris*, *Hottonia palustris*, *Cyclamen neapolitanum*, *Cyclamen repandum*, *Veronica anagalloides*, *Utricularia vulgaris*, *Acanthus spinossisimus*, *Nymphoides peltata*, *Periploca graeca*, *Baldellia ranunculus oides*, *Butomus umbellatus*, *Hydrocharis morsus-ranae*, *Zanichellia palustris*, *Ruscus aculeatus*, *Galanthus nivalis*, *Orchis simia*, *Orchis spitzelii.*

A smaller number of species (5) belong to the category of rare species (R), usually with small populations that are not as yet endangered, but are at high risk of extinction in the future: *Dittrichia viscosa*, *Rhamnus intermedius*, *Petteria ramentacea*, *Moltkea petraea* i *Asphodelus aestivus*. *Ludwigia palustris* is an endangered species (EN). It is facing a risk of extinction if the causing factors maintain their influence on the habitat.

Invertebrates

Rare, endangered and protected species of invertebrates of the upper and central part of the Neretva river basin: since the invertebrates of these parts of the Neretva river basin are poorly researched, there are no data on the rare, endangered and protected species of invertebrates.

***Rare, endangered and protected species of invertebrates of the lower part of the Neretva river basin*:** since the invertebrates of the lower part of the Neretva river basin are poorly researched, the data on the rare, endangered and protected species of invertebrates are scarce. A species of freshwater shrimp, *Palaemonetus antennarius*, found in the Baćine lakes, is extremely endangered.

Out of butterflies and moths, the following species are protected by the Croatian Law on Nature Protection:

- *Papilom machaon L.* (Old World swallowtail), and
- *Iphiclides podalirius L* (scarce swallowtail).

Vertebrates

Rare, endangered and protected species of vertebrates of the upper part of the Neretva river basin: as said, out of vertebrates in this part of the Neretva river basin, only fish were sufficiently researched. For the threat status of fish species, see Table 3.1.53

Table 3.1.53 Threat status of fish species in the upper part of the Neretva river basin

	SPECIES	Threat status	Appendix II of the Bern convention	Appendix III of the Bern convention	Appendix II of the Habitats Directive	Appendix IV of the Habitats Directive	Appendix V of the Habitats Directive
1	*Oncorhynchus mykiss*	None					
2	*Salmo trutta*	VU					
3	*Salmothymus obtusirostris oxyrhynchus*	CR					
4	*Salmo marmoratus*	CR (D.D.)					
5	*Salmo trutta m. lacustris*	None					
6	*Salvelinus alpinus*	None					
7	*Thymallus thymallus*	VU					
8	*Alburnus albidus*	VU		•	•		
9	*Carassius gibelio*	None					
10	*Cyprinus carpio*	None					
11	*Leuciscus c. cephalus*	None					
12	*Leuciscus cephalus albus*	VU		•			
13	*Leuciscus svallize*	VU		•			
14	*Phoxinellus alepidotus*	D.D.(VU)					
15	*Phoxinus phoxinus*	None					
16	*Rhodeus sericeus amarus*						
17	*Alburnoides binpunktatus*						
18	*Godio gobio*						
19	*Cobitis narentana*	VU					
20	*Cottus gobio*						
21	*Lepomis gibbosus*	None					
22	*Sander lucioperca*	None					

Rare, endangered and protected species of vertebrates of the central part of the Neretva river basin: as said before, out of vertebrates in this area, only fish and certain species of birds were sufficiently researched.

Fish*:* out of the ichtyo-fauna, critically endangered (CR) is Adriatic salmon *Salmothymus obtusirostris oxyrhynchus,* Dalmatian soiffe *Chondrostoma knerii* is endangered (EN*),* and the vulnerable species (VU) is Adriatic dace *Leuciscus Svallize*, which is, as well as Dalmatian soiffe, listed in Appendix III of the Bern convention. For the threat status of fish in this part of the Neretva river basin, see Table 3.1.54

Birds: the *Draft of the Red List of Endangered Birds of Bosnia and Herzegovina* (Obratil, Matvejev, 1989), lists the following species registered in the area of Vran-planina and Dugo Polje:

- Endangered species (EN)
  - Platalea leucorodia L. — Spoonbill
  - Hieraaetus pennatus (gmelin) — Booted Eagle
  - Tetrao urogallus l. — Capercaillie
  - Eemophila alpestris l. — Shore Lark
- Vulnerable species (VU)
  - Neophron percnopterus (l.) — Egyptian Vulture
  - Gvps fulvus (hablizl) — Griffon Vulture
  - Oircaetus gallicus (gmelin) — Short-toed Eagle
  - Falco peregrinus tunstall — Peregrine
  - Alectoris graeca (meisner) — Rock partridge

Apart from the listed species, the species golden eagle *Aquila chrysaetos (l.)* is also endangered.

Table 3.1.54 Threat status of fish species in the central part of the Neretva river basin

	SPECIES	Threat status	Appendix II of the Bern convention	Appendix III of the Bern convention	Appendix II of the Habitats Directive	Appendix IV of the Habitats Directive	Appendix V of the Habitats Directive
1	*Oncorhynchus mykiss*	None					
2	*Salmo trutta*	VU					
3	*Salmothymus obtusirostris oxyrhynchus*	CR					
4	*Salmo marmoratus*	CR (D.D.)					
5	*Salmo trutta m. lacustris.*	None					
6	*Thymallus thymallus*	VU					
7	*Alburnus albidus*	VU		•	•		
8	*Rutilus basak*	VU					
9	*Cyprinus carpio*	None					
10	*Chondrostoma knerii*	EN		•			
11	*Leuciscus cephalus albus*	VU		•			
12	*Leuciscus Svallize*	VU		•			
13	*Gasterosteus aculeatus*						
14	*Phoxinus phoxinus*	None					
15	*Anguilla anguilla*	None					
16	*Cobitis narentana*	VU					
17	*Cottus gobio*						
18	*Lepomis gibbosus*	None					
19	*Sander lucioperca*	None					

Rare, endangered and protected species of vertebrates of the lower part of the Neretva river basin: as said before, the vertebrates were researched more adequately in this part of the river basin.

Fish: Almost half of the fish species of the lower part of the Neretva river basin are endangered; among them are the species endemic to this area. At present, none of the fish species are protected either by Croatian or Bosnian law.

For a categorization of fish species in the lower part of the Neretva river basin according to their threat status and internationational conventions, see Table 3.1.55

Amphibians: for a list of protected species of amphibians in the Neretva delta according to Croatian law, see Table 3.1.56, and according to international conventions, see Table 3.1.57

Table 3.1.56 Threat status of amphibian species in Croatia

Species	According to the Red List of Amphibians in Croatia	Compensation[1] (HRK)	Protected species[2]	Endangered species[2]
Proteus anguinus	VU	8000	•	
Salamandra salamandra	-	500	•	
Triturus vulgaris	DD	1000	•	
Bombina variegata	-	1000	•	
Bufo bufo	-	1000	•	
Bufo viridis	DD	500	•	
Hyla arborea	NT	1000	•	
Rana ridibunda	-	500	•	
Rana dalmatina	-			•

1 - pursuant with the Regulation on Compensation for Damage Resulting from Illegal Acts Performed on Animal Species
2 - pursuant with the Regulations on Protection of Certain Species of Amphibians (*NN* 48/99.)

Table 3.1.57 Overview of threat status and protection of certain amphibian species on the European level

Species	Endangerment on the European level (IUCN)	Appendix II of the Bern Convention	Appendix III of the Bern Convention	Appendix II of the Habitats Directive	Appendix IV of the Habitats Directive	Appendix V of the Habitats Directive
Proteus anguinus	VU	•		•	•	
Salamandra salamandra			•			
Triturus vulgaris	D.D.		•			
Bufo bufo			•			
Bufo viridis		•			•	
Bombina variegata		•		•	•	
Hyla arborea	NT	•			•	
Rana dalmatina		•			•	

Rana ridibunda						•

Reptiles: for a list of protected reptile species in the Neretva delta according to Croatian law see Table 3.1.58, and according to international conventions, see Table 3.1.59

Table 3.1.58 Threat status of certain reptile species in Croatia

Species	Status according to the Red List of Reptiles of the Republic of Croatia	Compensation (HRK)
Testudo hermanni	NT	4000
Emys orbicularis	NT	1000
Podarcis melisellensis	NT	500
Elaphe situla	DD	8000
Natrix tesselata	DD	2000

Compensation pursuant with the Regulation on Compensation for Damage Resulting from Illegal Acts Performed on Animal Species (*NN* 84/96).

Table 3.1.59 Threat status of certain reptile species on the European level

Species	Appendix II of the Bern Convention	Appendix III of the Bern Convention	Appendix II of the Habitats Directive	Appendix IV of the Habitats Directive	Appendix II of CITES
Testudo hermanni	•		•	•	•
Emys orbicularis				•	
Ophisaurus apodus	•			•	
Anguis fragilis		•			
Hemidactylus turcicus		•			
Archaeolacerta oxycephala		•			
Lacerta trilineata	•			•	
Podarcis melisellensis	•			•	
Coluber gemonensis	•			•	
Coluber najadum		•		•	
Elaphe longissima	•			•	
Elaphe quatuorlineata	•		•	•	
Elaphe situla	•		•	•	

Malpolon monspessulanus		•			
Natrix natrix		•			
Natrix tesselata	•			•	
Vipera ammodytes	•			•	

Birds: according to the latest Red list of vertebrates of the Republic of Croatia, 148 bird species of lower Neretva belong to one of the categories of endangerment.

Out of nesting birds, 129 species belong to one of the categories, namely 11 species are regionally extinct (RE), 16 species are critically endangered (CR), 19 are endangered (EN), 13 vulnerable (VU), 9 data deficient (DD), 33 near threatened (NT), and 28 belong to the cathegory of least concern (LC).

Out of the birds that spend winters in the Neretva area, 18 species belong to one of the cathegories: 1 species is critically endangered (CR), 6 are endangered (EN), 2 vulnerable (VU), 5 near threatened (NT), and 4 belong to the cathegory of least concern (LC).

Out of non-nesting birds, 9 species belong to one of the categories: 2 species are regionally extinct (RE), 1 is critically endangered (CR), 1 endangered (EN), 1 data deficient (DD) and 4 near threatened (NT).

Out of birds that fly over this area, 20 species belong to one of the categories: 1 species is critically endangered (CR), 3 endangered (EN), 5 near threatened (NT), a 11 belong to the cathegory of least concern (LC).

Out of the total number of birds from the endangerment list (148), 15 species belong to two categories, namely depending whether the birds are nesting or non-nesting i.e. birds that fly over this area.

List of bird species in the Neretva estuary area that are globally endangered or endangered on the European level:

1. Black-throathed Diver *Gavia arctica*
2. Pygmy Cormorant *Halietor pygmaeus*
3. Little Bittern *Ixobrychus minutus*
4. Night Heron *Nycticorax nycticorax*
5. Squacco Heron *Ardeola ralloides*
6. Purple Heron *Ardea purpurea*
7. Spoonbill *Platalea leucorodia*
8. Gadwall *Anas strepera*
9. Garganey *Anas querquedula*
10. Short-toed Eagle *Circaetus gallicus*
11. Crvenonoga Kestrel *Falco vespertinus*
12. Peregrine *Falco peregrinus*
13. Quail *Coturnix coturnix*
14. Common Crane *Grus grus*
15. Corncrake *Crex crex*

16.	Scops Owlavica	*Burhinus oedicnemus*
17.	Curlew	*Numenius arquata*
18.	Redshank	*Tringa totanus*
19.	Wood Sandpiper	*Tringa glareola*
20.	Šumska Woodcock	*Scolopax rusticola*
21.	Great Snipe	*Gallinago media*
22.	Black Tern	*Chlidonias nigra*
23.	Turtle Dove	*Streptopelia turtur*
24.	Barn Owl	*Tyto alba*
25.	Kingfisher	*Alcedo atthis*
26.	Bee-eater	*Merops apiaster*
27.	Wryneck	*Jynx torquilla*
28.	Crested Lark	*Galerida cristata*
29.	Woodlark	*Lullula arborea*
30.	Skylark	*Alauda arvensis*
31.	Sand Martin	*Riparia riparia*
32.	Swallow	*Hirundo rustica*
33.	Tawny Pipit	*Anthus campestris*
34.	Red-backed Shrike	*Lanius collurio*
35.	Lesser Grey Shrike	*Lanius minor*
36.	Greatr Grey Shrike	*Lanius excubitor*
37.	Woodchat Shrike	*Lanius senator*
38.	Stonechat	*Saxicola torquata*
39.	Black-eared Wheatear	*Oenanthe hispanica*
40.	Blue Rock Thrush	*Monticola solitarius*
41.	Olivaceous Warbler	*Hippolais pallida*
42.	Orphean Warbler	*Sylvia hortensis*
43.	Spotted Flycatcher	*Muscicapa striata*
44.	Rock Bunting	*Emberiza cia*
45.	Black-headed Bunting	*Emberiza melanocephala*

List of bird species of the Neretva estuary area which are endangered on the Croatian level (if not endangered on the European level):

1.	Little Egret	*Egretta garzetta*
2.	Teal	*Anas crecca*
3.	Goldeneye	*Bucephala clangula*
4.	Gossander	*Mergus merganser*
5.	Montagu's Harrier	*Circus pygargus*
6.	Sparrowhawk	*Accipiter nisus*
7.	Yellow wagtail	*Motacilla flava*

In the area of Hutovo blato, the extinct, probably extinct, endangered, rare and vulnerable species are:

Extinct species (EX):

1	Anser anser	Greylag
2.	Circus pygargus	Montagu's Harrier
3.	Chlidonias niger	Black Tern

4.	Grus grus	Common Crane

Probably extinct species:

1.	Aquila clanga Pallas	Spotted Eagle
2.	Aquila pomarina	LesserSpotted Eagle

Endangered species (EN)

1.	Phalacrocorax pygmaeus	Pygmy Cormorant
2.	Ardea purpurea	Purple Heron
3.	Platalea leucorodia	Spoonbill
4.	Plegadis falcinellus	Glossy ibis
5.	Ciconia ciconia	White Stork
6.	Falco biarmicus Temminck	Lanner
7.	Merops apiaster	Bee-eater
8.	Upupa epops	Hoopoe
9.	Eremophila alpestris	Shore Lark

Vulnerable species (VU)

1.	Ixobrychus minutus	Little Bittern
2.	Nycticorax nycticorax	Night Heron
3.	Ardeola ralloides	Squacco Heron
4.	Egretta garzetta	Little Egret
5.	Milvus korschun	Red Kite
6.	Circaetus gallicus	Short-toed Eagle
7.	Circus aeruginosus	Marsh Harrier
8.	Falco peregrinus Tunstall	Peregrine
9.	Alectoris graeca	Rock partridge
10.	Rallus aquaticus	Water Rail
11.	Porzana porzana	Spotted Crake
12.	Porzana parva	Little Crake
13.	Porzana pusilla	Baillon's Crake
14.	Chlidonias hybrida	Whiskered Tern
15.	Sterna hirundo	Common Tern
16.	Alcedo atthis	Kingfisher
17.	Dendrocopos medius	Middle Spotted Woodpecker
18.	Sylvia hortensis	Orphean Warbler
19.	Sylvia melanocephala	Sardinian Warbler
20.	Remiz pendulinus	Penduline

Rare species (R)

1.	Podiceps ruficollis	Little Grebe
2.	Podiceps nigricollis	Black-necked Grebe
3.	Ana s strepera	Gadwall
4.	Aquila chrysaetos	Golden Eagle
5.	Tringa totanus	Redshank
6.	Bubo bubo	Eagle Owl
7.	Apus melba	Alpine Swift

8.	Riparia riparia	Sand Martin
9.	Hirundo daurica	Daurska Swallow
10.	Lanius senator	Woodchat Shrike
11.	Cinclus cinclus	Dipper

Fig. 3.1.3 Spoonbills at the Neretva estuary

Mammals: for a list of protected species of mammals in the Neretva delta according to Croatian law, see Table 3.1.60, and according to international conventions, see Table 3.1.61.

Table 3.1.60 Threat status and protection of certain mammal species on the national level

Latin name of species	Status according to the Red List of Mammals in Croatia	Compensation (HRK)	Protected sp. according to the Regulation on Protection of Mammals	Protected sp. according to the Regulation on Close Season
1	2	3	4	5
1. *Erinaceus concolor*		3000	●	
2. *Crocidura leucodon*		500	●	
3. *Crocidura suaveolens*		500	●	
4. *Suncus etruscus*		500	●	
5. *Rhinolophus blasii*	VU	4000	●	
6. *Rhinolophus euryale*	VU	2000	●	
7. *Rh. ferrumequinum*	NT	1000	●	
8. *Rh. Hipposideros*	NT	3000	●	
9. *Rhinolophus mehelyi*	RE	4000	●	
10. *Myotis bechsteini*	VU	4000	●	
11. *Myotis blythi*		2000	●	
12. *Myotis capaccinii*		2000	●	
13. *Myotis daubentoni*		4000	●	
14. *Myotis emarginatus*	NT	3000	●	
15. *Myotis myotis*	NT	2000	●	
16. *Myotis mystacinus*		2000	●	
17. *Myotis nattereri*		3000	●	
18. *Miniopterus schreibersii*	EN	2000	●	
19. *Pipistrellus kuhlii*		1000	●	
20. *Pipistrellus nathusii*		4000	●	
21. *Pipistrellus pipistrellus*		1000	●	
22. *Hypsugo savii*		1000	●	
23. *Eptesicus nilssoni*		4000	●	
24. *Eptesicus serotinus*		2000	●	
25. *Plecotus kolombatovici*	DD		●	
26. *Nyctalus noctula*		2000	●	
27. *Nyctalus lasiopterus*	DD	4000	●	
28. *Nyctalus leisleri*	NT	4000	●	
29. *Tadarida taeniotis*		4000	●	
30. *Vulpes vulpes*				●
31. *Canis lupus*	NT		●	
32. *Canis aureus*				●
33. *Mustela nivalis*				●
34. *Mustela putorius*				●
35. *Martes foina*				●
36. *Meles meles*				●
37. *Lutra lutra*	DD	30000	●	

38. *Felis silvestris*		10000		
39. *Sus scrofa*				•
40. *Sciurus vulgaris*	NT	2000	•	
41. *Apodemus mystacinus*				
42. *Apodemus sylvaticus*				
43. *Dinaromys bogdanovi*	DD		•	
44. *Rattus norvegicus*				
45. *Rattus rattus*				
46. *Mus domesticus*				
47. *Micromys minutus*	NT			
48. *Myoxus glis*	LC	2000		
49. *Eliomys quercinus*	NT	3000	•	
50. *Lepus europaeus*	NT			•
51. *Oryctolagus cuniculus*				•

Compensation pursuant with the Regulation on Compensation for Damage Resulting from Illegal Acts Performed on Animal Species (*NN* 84/96).

Table 3.1.61 Threat status and protection of certain mammal species according to European conventions

Latin name of species	IUCN Europe	Bern Convention	Habitats Directive	Bonn Convention
		Appendix	Appendix	Appendix
1	2	3	4	5
1. *Erinaceus concolor*				
2. *Crocidura leucodon*		III		
3. *Crocidura suaveolens*		III		
4. *Suncus etruscus*		III		
5. *Rhinolophus blasii*	LR-nt	II	II/IV	II
6. *Rhinolophus euryale*	VU	II	II/IV	II
7. *Rh. Ferrumequinum*	LR-nt	II	II/IV	II
8. *Rh. hipposideros*	VU	II	II/IV	II
9. *Rhinolophus mehelyi*	VU	II	II/IV	II
10. *Myotis bechsteini*	VU	II	II/IV	II
11. *Myotis blythi*		II	II/IV	II
12. *Myotis capaccinii*	VU	II	II/IV	II
13. *Myotis daubentoni*		II		II
14. *Myotis emarginatus*	VU	II	II/IV	II
15. *Myotis myotis*	LR-nt	II	II/IV	II
16. *Myotis mystacinus*		II	IV	II
17. *Myotis nattereri*		II	IV	II
18. *Miniopterus schreibersii*	LR-nt	II	IV	II

19. *Pipistrellus kuhlii*		II	IV	II
20. *Pipistrellus nathusii*		II	IV	II
21. *Pipistrellus pipistrellus*		III	IV	II
22. *Hypsugo savii*		III	IV	II
23. *Eptesicus nilssoni*		II	IV	II
24. *Eptesicus serotinus*		II	IV	II
25. *Plecotus kolombatovici*				
26. *Nyctalus noctula*		II	IV	II
27. *Nyctalus lasiopterus*	LR-nt	II	IV	II
28. *Nyctalus leisleri*	LR-nt	II	IV	II
29. *Tadarida taeniotis*	DD	II/III	II	II
30. *Vulpes vulpes*				
31. *Canis lupus*		II	II/IV	
32. *Canis aureus*			V	
33. *Mustela nivalis*		III		
34. *Mustela putorius*		III	V	
35. *Martes foina*		III		
36. *Meles meles*		III		
37. *Lutra lutra*	NT	II	II/IV	
38. *Felis silvestris*		II	IV	
39. *Sus scrofa*				
40. *Sciurus vulgaris*		III		
41. *Apodemus mystacinus*				
42. *Apodemus sylvaticus*				
43. *Dinaromys bogdanovi*	LR-nt			
44. *Rattus norvegicus*				
45. *Rattus rattus*				
46. *Mus domesticus* miš				
47. *Micromys minutus*	LR-nt			
48. *Myoxus glis*	LR-nt	III		
49. *Eliomys quercinus*	VU	III		
50. *Lepus europaeus*		III		
51. *Oryctolagus cuniculus*				